LEARNING ABOUT PLACE AND THE ENVIRONMENT THROUGH SCHOOL-BASED ECOLOGICAL MONITORING IN THE FRENCHMAN RIVER BASIN, SASKATCHEWAN

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ABSTRACT

Community-based ecosystem management (CBEM) is increasingly advocated as a way to conserve biodiversity, monitor, and maintain ecosystem functions in the context of local land use practices, through an inclusive management approach. However, while CBEM is based in principles of inclusion, there is very little attention in environmental management and education literature directed to the role of youth in stewardship activities, and the environmental learning outcomes and other meanings that may result from these practices.

The purpose of this thesis is to describe participatory and experiential environmental learning carried out in the Frenchman River Basin, Southwestern Saskatchewan. Here, I investigated how students' participation in an ecological monitoring program contributed to their understanding of their local environment and to their sense of place, and considered how the development of a learning community among students, teachers, community members, and academic researchers influenced these processes.

This research adopts a mixed methods approach, employing knowledge-based tests to explore student learning outcomes and using interpretations of place through student photographs and interviews to examine their sense of place. I take a phenomenological approach to defining what constitutes *place* for students, as well as how sense of place is formed for them, elucidating how their experiences participating in the ecological monitoring program entered the process of meaning construction.

This case study found that both experiential and participatory approaches to learning helped foster environmental understanding as well as place appreciation and attachment. The Frenchman River, previously described as a taken-for-granted feature of the familiar landscape and largely associated with its agricultural importance, was re-negotiated as a social space, a place of play, learning, and biological significance. Research findings also suggest that place meanings are deeply rooted in students' rural identity, and that this influenced their participant experience, independent of environmental learning outcomes.

The creation of a learning community was a mobilizing force for school-based ecological monitoring and information sharing, while acting as a source of symbolic significance for student participants, helping students to *see* their place from the perspective of an outsider.

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DEDICATION

To my loving parents, Marlee and Lorne, for exposing me to a lifetime of experience from an early age and for having always encouraged me to achieve my goals.

And to my best friend and partner in life, Michael, I share this work with you…for having confidence in my abilities during times when I had doubt, for providing seemingly infinite compassion and support from which I too often drew, and perhaps most significantly, for always listening.

Finally, I dedicate this thesis to the young people of the world, in whose hands our future rests, but whose voices are seldom heard.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AAC	Agency Advisory Committee
BSE	Bovine Spongiform Encephalopathy
CAC	Community Advisory Committee
CBEM	Community-Based Ecosystem Management
CMN	Canadian Museum of Nature
CRSE	Centre for Rural Studies and Enrichment
EE	Eastend
EMAN	Ecological Monitoring and Assessment Network
FRBP	Frenchman River Biodiversity Project
GNP	Grasslands National Park
GPS	Global Positioning System
ICT	Information and Communication Technologies
PEEL	Participatory and Experiential Environmental Learning
RSM	Royal Saskatchewan Museum
SC	Steering Committee
SE	Saskatchewan Environment
SSHRC	Social Sciences and Humanities Research Council
VM	Val Marie

CHAPTER 1: INTRODUCTION

1.1 Background and Statement of Problem

Environmental education has been broadly described as a process of recognizing the inter-relatedness between one's values, culture, and biophysical surroundings (Barraza *et al.* 2003), and then as the practice of "becom[ing] aware of the environment and acquir[ing] the knowledge, values, skills, and experiences to solve problems for present and future generations" (Vaughan *et al.* 2003, 12). Since the environmental movement of the 1960's, concepts of ecology and human-environment interaction have been gradually incorporated into school curricula in North America and Europe (Bakshi 1980; e.g. de Haan *et al.* 2000), as understanding and addressing environmental issues have become widely recognized as necessary for the sustainability of economic, social, and ecological systems. Nowhere are these goals for sustainability more relevant today than in the Canadian prairies, where cultural values and local economies are closely tied to the land. At the same time, the land that supports these rural communities has been extensively modified by agricultural practices, threatening water quality and biological diversity (PCAP Partnership 2003).

In response to concerns over land use and conservation, resource managers are beginning to recognize the role that local people can play in the decision-making and practices that affect the ecological and social health of their communities. This emerging philosophy, termed community-based ecosystem management (CBEM), is a holistic, participatory approach to environmental management "driven by explicit goals, executed by policies, protocols, and practices, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure, and function" (Ecological Society of America 1996 in Cortner and Moote 1999, 40). Described as the fundamental "reframing of human relationships with one another and with other ecosystem components" (Moote *et al.* 2001, 97), CBEM offers an opportunity for broad-based involvement within a community,

espousing a climate of collaboration and mutual learning among participants (Ack *et al.* 2001; Endter-Wada *et al.* 1998; Moote *et al.* 2001). However, while CBEM is premised on principles of inclusion and collaboration, there is little attention directed towards the social positioning of youth, or to schools as centres of learning in environmental science and management. This thesis is born out of the view that one way to enhance the role of young people is by engaging them in stewardship activities. Environmental stewardship is an important part of ecosystem management because it offers a tangible way to involve local people of all ages and with diverse interests, it is a practice in which outcomes are measurable, and where benefits can be realized locally over the long-term.

Although there is growing theoretical support for the relationship between individuals' value for the natural environment, and how they impact, or care for it (Kruger and Shannon 2000; Stein *et al.* 1999), there is an absence of empirical work investigating how ecosystem stewardship activities mould young citizens' understanding of their local environment, and how this form of participation may influence the meaning that youth attribute to a place. In attempting to address these concerns, research on rural sustainability highlights the importance of understanding how educational background and attachment to places shape the experiences and values of young people in rural communities (e.g. Glendinning *et al.* 2003). However, rural youth culture – or what constitutes the experiences of young people growing up in rural areas and what they describe as being important to them - has been largely overlooked in sustainability literature, particularly in the agricultural context (Brueckner 2004). My exploration of "sense of place" in this thesis is a useful framework for studying the social constructions of rural youth and to take into account the importance of the cultural context in which learning takes place and meanings are generated. [1]

[1] The concept of "culture" is complex. It is widely applied within social sciences and humanities discourse as the norms, values and beliefs, as well as "behaviour patterns, socially acquired and transmitted by means of symbols" (Fairchild 1967 in Berger 1995, 80). I therefore choose to think of culture as an active agent in how one *sees* the world and defines oneself within it, in relation to others. Culture is also a product of that agency, reflected in the people, places, and activities in which one engages. The culture of rural youth encompasses multiple identities, reflecting both the cultural make-up of a particular place and the social group.

Youth have an important role to play in the sustainability of their communities, and priorities in research and education must now be directed towards understanding and creating educational experiences that strengthen their relationship with place, while building on their knowledge of, and value for the environment. This research takes seriously the role of youth in environmental stewardship. To do this, my project merged environmental education with the practice of CBEM by engaging students in an ecological monitoring program. My thesis is based on the experiences that resulted from the implementation of this program at the secondary school level, in the rural, agricultural communities of Eastend and Val Marie, Saskatchewan. Here, students worked in affiliation with the Frenchman River Biodiversity Project (FRBP) – an initiative aimed at including university researchers, representatives from federal and provincial government agencies, and local residents (including schools) in a study of the Frenchman River ecosystem. I choose to think of this project as having contributed to the development of a "learning community." I borrow this term from literature that originates in the area of community education (e.g. Decker 1992a; 1992b) that was developed in response to government cutbacks for school districts in the United States during the 1980's, and which resulted in communities taking the necessary steps to meet their own needs for education and to expand learning opportunities for local people (Decker 1992b). Part of this mobilization involved transforming schools into places that could address community-specific problems while drawing from local resources, developing partnerships with other groups and agencies, and fostering broad-spectrum involvement from community members (Decker 1992b). The idea was that the school could serve as a centre for learning and action towards the betterment of the entire community. In this Master's thesis, I adapted this conceptual framework for a learning community to describe a network of individuals and groups, with diverse interests and experiences who are willing to come together to engage in a process of mutual learning through commitment to a shared project, and toward a common goal, in this case, of sustainability.

1.2 Research Questions and Objectives

The purpose of this study is to describe how participatory and experientially-based approaches to environmental education within a high school curriculum may contribute to students' environmental awareness and sense of place, and how a learning community may shape these outcomes. In this research, I use the term participatory and experiential environmental learning (PEEL) to describe learning about the environment through a process that is grounded in experience and is socially interactive and inclusive. This work is based on the premise that a sound understanding of the conditions and characteristics of one's local environment, as well as a strong sense of place, will lead to a greater commitment to environmental stewardship, and ultimately rural sustainability (see Figure 1.0). Furthermore, the research is guided by the assumption that local understanding and sense of place can be strengthened through the creation of a learning community (see Figure 1.0). I propose that learning communities are the social-structural support mechanisms that facilitate participatory and experiential environmental learning within schools.

My thesis addresses the following questions in the context of a phenomenologically oriented case study of students' participation in an ecological monitoring program:

- How does participating in an ecological monitoring program improve students' awareness of their local environment?
- What meanings do students derive through participation in ecosystem stewardship activities?
- What is the role of a learning community in facilitating knowledge acquisition within a high school curriculum?
- How do these experiences influence students' perceptions of the place in which they live?

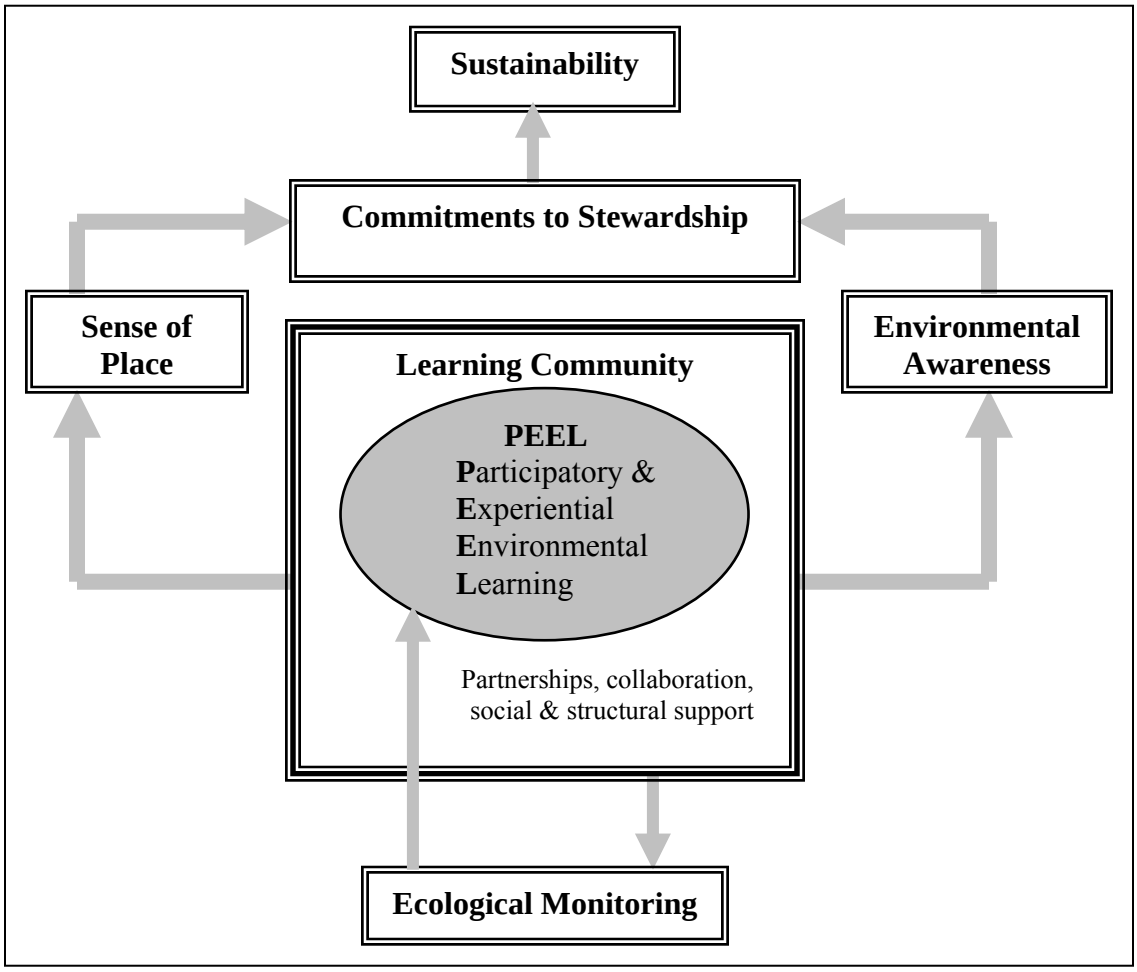

Figure 1.0: Conceptual framework for Master's thesis.

In exploring these questions, this thesis weaves together the concepts of sense of place, stewardship and CBEM, environmental education, experiential and participatory learning, and learning communities – themes that have not traditionally been examined together, and which are difficult to integrate. However, considering the linkages among these bodies of knowledge provides a unique and comprehensive view into how they interact to guide students' learning outcomes, within a spatially and temporally referenced framework.

1.3 Thesis Organization

This thesis summarizes the outcomes of the ecological monitoring project that was carried out in the study communities. In Chapter 2, I begin by presenting a review of the literature that provides a theoretical basis for my research. In Chapter 3, I set the context of this case with an overview of the study area and the larger biodiversity study with which my project was affiliated. Next, I describe how my research evolved from the implementation of the monitoring program in schools to the collection and analysis of qualitative and quantitative data. The presentation of my results begins in Chapter 4, and includes an assessment of barriers to participation within the project, with a specific focus on identifying what constitutes meaningful participation in the context of community-school-university collaboration. I then present students' environmental learning outcomes, and finally I consider the role of this learning community in the acquisition of this knowledge. Chapter 5 provides an in-depth examination of the meaning of students' experiences participating in the program, with an emphasis on how meaning is constructed to form their sense of place, what they define as important about their place, and how these meanings are articulated by them. Lastly, based on this understanding, I consider how the ecological monitoring project impacted students. In Chapter 6, I conclude by contemplating how the guiding concepts in this research, namely "sense of place," "participatory and experiential environmental learning," and "learning community" come together in the context of this project. I also provide a critique of the methods employed, while considering the significance of this work and implications for future research.

1.5 Notes to Reader

In his own work on research methodologies involving the study of rural youth, Leyshon (2002, 180) maintains that because of students' communication of meanings, which are largely articulated in the form of what he refers to as richly-textured accounts of rural life or "micro-geographies," researchers must be cautious not to compartmentalize or oversimplify research findings at the expense of the true meanings of participants' experiences. Much of the data in this thesis are presented in their raw form (particularly in Chapters 4 and 5), through the use of direct quotations in order to preserve the language

employed by young participants. I choose this strategy deliberately to favour their *voice* over my own broad interpretations.

When student participants are quoted or paraphrased, I use their participant identification number and appended letter (e.g. student participant 1a, 2b). Each student is assigned a number (1 through 10) as well as an accompanying letter that corresponds to one of the two interviews from which data may have been taken (a or b). In order to preserve anonymity, pseudonyms are also used in any quotations where participants name a person or persons within the community. I identify adult participants by their role in the project (e.g. principal, teacher participant) and with the appropriate abbreviation, Val Marie (VM) or Eastend (EE), in order to compare, contrast, or portray the position of the two respective schools or communities, or when I feel that their particular perspective is relevant to my findings. In all other instances, I use an identification number (e.g. participant 11) for these adult participants.

In this thesis, I refer to my experiences in both the communities and schools of Eastend and Val Marie. It is important to note, however, that although my initial objective was to focus my fieldwork in both schools as equal participants in my study, after significant deliberation (and once the majority of the fieldwork was already completed in Eastend), I elected to conduct my research in Eastend alone. This decision was based on a relatively narrow timeframe to complete fieldwork (partly due to weather), the desire to maintain the scope of my Master's project within reasonable limits, as well as the particularly favourable reception towards this project at Eastend School, in a region that was politically charged and wary of outside research. As a result, my role in Val Marie changed early on in my fieldwork, from that of a student researcher to largely that of a facilitator for the ecological monitoring program.

In addition, my own work was affiliated with a study funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) and led by Dr. Scott Bell and Dr. Maureen Reed, examining landowners' perspectives of recent initiatives to conserve biodiversity and protect habitat in Southwestern Saskatchewan. While I was conducting interviews with farmers and ranchers for the SSHRC project, I was also collaborating with members of the FRBP to carry out ecological monitoring in local schools, as part of my own study. This dual positioning provided a unique perspective of tensions over land use, conservation, and environmental research in the

region. These insights inspired some of my writing on the challenges of working within a small community on issues that have implications for the sustainability of the local economy, culture, and environment.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This research explores the meanings and learning outcomes that arise through participation in an ecological monitoring project, and thus a central theme guiding this research is also the process by which these meanings are created and learning is achieved. In elucidating the relationships between participation and learning, this work draws from several bodies of literature and empirical examples, which I review in the subsequent sections. First, work in the area of sense of place speaks to the importance of the social and spatial context of learning, lending insight into how one's sense of place may both influence, and be influenced by, an environmental education program. Second, I explore the philosophy and practice of ecosystem stewardship within the broader CBEM framework, and propose that stewardship activities may not only be thought of as a practice in science, but also as a "way of learning," setting the stage for how a stewardship project was incorporated in the context of my own research. Third, theoretical work in the area of participatory and experiential learning also informs this work (particularly as a way of understanding learning and pedagogy), drawing connections to environmental understanding and sense of place. Lastly, I explore the concept of a learning community, how it is applied in the literature, while suggesting how it may fit within the context of my own research and the school-based ecological monitoring program, upon which my work is based. The concept of a learning community provides a useful way of thinking about how broad participation within a stewardship project may facilitate the various forms of learning described above.

2.2 Moving Towards a Greater Sense of Place

The meaning of *place* is complex and at times convoluted, giving rise to multiple interpretations of the concept in human geography, all of which share common characteristics for describing geographic space, as shaped by social interactions, meanings, and identity (e.g. Ahearn 1994; Johnston *et al*. 2000; Ryden 1993; Stedman 2002; Tuan 1977). Agnew (1987, in Johnston *et al.* 2000, 583) mirrors these themes in his description of place as consisting of three central elements: "the setting in which social relations are constituted (these can be informal or institutional); location, the geographical area encompassing setting for social interaction…and sense of place, the local structure of feeling." Stedman (2002) expands on the latter concept, sense of place, describing it as human social and psychological processes that are connected to a particular setting. Sense of place, therefore, emerges as a product of combined meanings that people confer to these places. This view of sense of place is beginning to surface - although sporadically and sometimes under the guise of different terminology - in ecosystem management (e.g. Kruger and Shannon 2000; Kruger 2001), environmental education (e.g. Gurevitz 2000), and environmental psychology literature (Stedman 2002; 2003) as a way of understanding how commitments to sustainability may be fostered by building upon people's environmental values and attachment towards the land.

Because places are often locally bounded sites in which people build memories, experiences, and hold emotional attachments (Kruger 2001; Walck 2003), both local and social aspects of place have become central themes in the investigation of how sense of place may be cultivated. This understanding guided work by Kruger and Shannon (2000) in their examination of a civic social-assessment process, where high school students in the community of White Pass, Washington, joined with other community members, resource managers and researchers to learn about the community, its history, its residents, and its ties to the local forest. The study found that students' investigation of their local community and forests contributed to an enhanced awareness of themselves, their place, and their role within the larger community. Hence, their findings suggested that learning experiences are most effective for fostering feelings of attachment when they are locally-situated and participatory. Other theoretical work supports this notion, proposing that we can best understand our environment when we view it in a specific place (Walck 2003), as

being either familiar (such as one's home community), or symbolic (as projected by the values by which one defines oneself) (Greider and Garkovich 1994). Learning experiences that take place in familiar sites, which are already imbued with personal and symbolic meanings, seem to have the greatest impact on the learner with respect to sense of place.

Many researchers have focussed on understanding people's perception of landscapes based on their aesthetic qualities (e.g. scenery, level of development), or uses (e.g. recreation, industry, place to escape) (e.g. Stedman 2003); however, others maintain that perceptions of place go beyond the visual and must be explored on a deeper, or more holistic level (Kruger 2001). Kruger (2001, 178) states that "we cherish places not just by what we can get from them but for the way we define ourselves in relation to them…[as] places with stories, memories, meanings, sentiments, and personal significance." This observation is based on an understanding that one's identity is intimately connected with places of familiarity, and that this identity is a cornerstone of one's sense of place – a notion that has been confirmed by work in the area of environmental psychology (e.g. Stedman 2002; 2003), and rural sociology (e.g. Greider and Garkovich 1994), particularly relating to individuals' interpretations of landscape as influenced by their socio-cultural context. For example, research conducted in rural, agriculturally-based communities, often points to how cultural identity affects people's perceptions of nature (e.g. McCormack 2002), and how understanding these views is vital to predicting how they may impact and/or manage the physical environment (e.g. Greider and Garkovich 1994; Kruger 2001; Naveh and Lieberman 1994; Stein *et al.* 1999). Greider and Garkovich (1994) emphasize that *describing* socially constructed interpretations or meanings – the building blocks of sense of place - is critical to this relationship. Describing place, as it is defined by a particular socio-cultural group, also carries relevance for environmental education, where identity would be a factor in how one experiences, perceives, or understands the environment. Thus, for researchers concerned with the impacts of environmental education on sense of place, understanding place identity – or how one defines oneself in relation to place – is *a priori* to assessing environmental learning outcomes, their significance, and/or human behaviours that may result from the learning experience. These insights relate to the idea of learning as a "process of using prior interpretation to construe a new or a revised interpretation of the meaning of one's experience as a guide to future action" (Mezirow and Associates 2000, in Fitzpatrick 2005, 21).

We now understand that places - construed from social relations and subjective experience – are also the canvases upon which social interactions and meanings can be further negotiated and defined. The question remains: how do we integrate emotions and values together with knowledge and understanding in education (Apple 1999), or in this case, teaching about the environment? This thesis is based on the premise that environmental stewardship activities that incorporate individual experience and social interaction (towards the creation of shared meanings, knowledge, and collective memories) within familiar or local places, may help to build upon participants' sense of place and environmental awareness.

2.3 Participation in Ecosystem Stewardship

Previous research in CBEM demonstrates that participatory approaches to resource management must occur in "place-based" and "interest-based" communities, where there is a willingness among local community members to be involved in management activities, and to conserve places that are meaningful to them (Cortner and Moote 1999; Moote *et al.* 2001). Historically, despite the presence of local interest in some communities, traditional approaches to environmental management and research have been characterized by a resistance of the scientific community to the entrance of the lay citizen in scientific enquiry - a custom that is shown to be a hindrance to any meaningful participation (Moote *et al.* 2001). However, more recently, participatory and collaborative approaches among individuals, communities, government and resource management agencies, and other groups, have become increasingly recognized as a way to empower local people, and enhance mutual learning and local autonomy in environmental decision-making, while also laying the groundwork for ecosystem stewardship (e.g. Ack *et al.* 2001; Johnson 1997).

The concept of stewardship is largely value-based, celebrated as both a philosophy and practice of care for the natural environment and its long-term health (i.e. through protection, restoration, conservation and monitoring). For these reasons, stewardship is regarded as the core of CBEM efforts, described as the "glue" that holds these initiatives together (Ack *et al.* 2001, 118). The idea of stewardship is not a new one. There are a number of stewardship groups surfacing in both rural and urban contexts, which can also be found within classrooms in Canada (see Alberta Riparian Habitat Management Society

2004; Biosphere Canada 2004; EMAN 2003; Environment Canada 2002; Envirothon B.C. 2006; Pacific Streamkeepers Federation 2003), the USA (see Kiefer and Kemple 1999; NatureMapping Partnership 1996), Europe (see Palmer 1997), and elsewhere. Ultimately, the emergence of these efforts stems from an identified need to empower local community members (of all ages) to take personal and civic responsibility for, and action on behalf of the environment (Burns 2001) directed towards the sustainability of their communities. The Canadian Ecological Monitoring and Assessment Network (EMAN) illustrates the growing number of grass-roots initiatives, which share similar objectives for community-based monitoring of environmental change. A pilot project was conducted between 2002-2003 in communities across Canada to determine ways to build local capacity for ecological monitoring, and which could subsequently lead to more inclusive decision-making in environmental management (EMAN 2003, 5). Some of the factors that were identified in their model as critical for success in community-based ecological monitoring initiatives are shown in Table 2.0:

Table 2.0. Factors critical for successful community-based ecological monitoring.

▪ *Approaches are appropriate to local context and adaptable*
▪ *Information delivery mechanisms are established:* Information needs are identified and communicated, community based monitoring programs are demand-driven, data is communicated as meaningful information.
▪ *The experience must be meaningful for participants:* Common concerns are acknowledged, local knowledge is respected, benefits of ecological monitoring are understood, adequate training and equipment for monitoring are provided, and monitoring results are communicated to the public.
▪ *Partnerships in pursuit of sustainability are necessary:* Partnerships to maximize capacity and resources are developed, partnerships to address ecological issues at regional or landscape scales are developed.
▪ *Collaborative approaches are implemented:* Forums for multi-stakeholder discussion are encouraged, community visioning to define common challenges and goals is conducted, influence on government policies, public values, and industry practices is achieved.
▪ *Ongoing national support for a coordinated network:* Commitment to community initiatives is demonstrated, support in the form of resources, expertise, and staff is provided, established networks and partnerships are maintained.
▪ *Coordination is critical:* Communication, facilitation, negotiation and mediation skills are developed, participants are coordinated at a local scale, and broader partnerships and networks among communities are maintained.

(Source: adapted from EMAN 2006).

Central to the CBEM model is recognizing that the involvement and knowledge of local people is integral to these efforts. After all, sustainability is not only concerned with ecological systems, but also in meeting the needs of human communities in the management of ecosystems. Kruger (2001, 176) suggests that carrying out sustainable practices, or in this case environmental stewardship, not only requires a technical and scientific understanding (often thought to be held only by "outside experts"), but also cultural, experientially-based, locally-situated knowledge. This supports the evolving definition of sustainability to recognize the role of subjectivity and social values together with the more traditional biophysical and economic priorities in the management and maintenance of ecosystems. Thus, CBEM initiatives incorporate elements of identity, collaboration, local knowledge, and place-making in their definition and function. The basis of this idea is that collaboratively integrating local knowledge, or knowledge rooted in the cultural practices and meanings held by local people (thereby diversifying interests and the range of experiences that are present), can positively contribute to stewardship practices, while also building upon these participants' perceived role within their communities (Ack *et al.* 2001; Pratt and Freeston 2002; Trumbull *et al.* 2000).

Although much of the empirical focus for participation in ecosystem management and stewardship can be found in civic, or citizen science approaches - described in the literature as "an effort to democratize science" and a way in which to create and share knowledge among people with different backgrounds who are involved in the research process (Jenkins 1999; Kruger and Shannon 2000, 464; Shannon and Antypas 1996), little attention has actually been directed to identifying the educational impact of such efforts on its participants (Trumbull *et al.* 2000). Similarly, the educational value of community-based stewardship projects involving youth and the meanings that may arise from these partnerships have been largely neglected by researchers. The learning outcomes and processes that occur through initiatives such as ecological monitoring require further exploration and description, so that both local community leaders and educational policy makers recognize the utility of stewardship for achieving both environmental health in communities, and learning for participants.

2.4 Why Participatory and Experiential Environmental Learning?

Since the United Nations Conference on Environment and Development (Earth Summit) in 1992, philosophies for environmental education have been increasingly aligned with goals to establish equitable and democratic processes for conserving biodiversity and achieving sustainable development (Ahearn 1994; Barraza *et al.* 2003; Diduck 1999; Environment Canada 2002; Palmer 1997; Tapsell *et al.* 2001). Enacting democracy in the context of environmental education requires engaging a broad citizenry that includes multi-stakeholder and multi-generational participation in environmental practices and decision-making – the outcomes of which affect individuals' lives and their communities. In practical terms, inviting people to actively participate in projects and activities within their communities may create the learning experiences needed for individuals to develop the skills, values, and attitudes that are necessary to be able to address environmental concerns. To this end, environmental learning is seen both as a social enterprise, in which people are included as acting members or participants within a larger movement, and also as an experiential one. In other words, the value of participation goes beyond social inclusion, also operating at the level of each individual, as they participate in experiencing their external social and physical world (Tuan 1977). With these principles in mind, environmental education may be best achieved through an action-based, community orientation (Environment Canada 2002), grounded in participation (Barraza *et al.* 2003; Diduck 1999) and personal experience (Palmer 1997). I use the term participatory and experiential environmental learning (PEEL) to respond to the need to bring together both the social and experiential aspects of knowledge acquisition into the practice of environmental education - an approach to learning about the environment, and one's place within it, through a process that is directive and engaging, as well as socially interactive and inclusive.

The concept of experiential learning is anchored in constructivist learning theory, which posits that as part of the lived experience, individuals "actively construct meaning by interacting with their environment," and thus knowledge may be gained by participating in their surroundings, "incorporating new information into their existing knowledge" (Stein and Imel 2002, 45). Experiential approaches are applied in the fields of environmental education (e.g. Gurevitz 2000; O'Sullivan 1999; Palmer 1997), environmental management education (e.g. Loevinsohn *et al.* 2002; Walck 2003), and sociology (e.g. Falk and

Kilpatrick 2000), built on the assumption that valued activities or interests induce behaviours that lead to transformative learning (Falk and Kilpatrick 2000; Gurevitz 2000; Loevinsohn *et al.* 2002; O'Sullivan 1999; Palmer 1997; Walck 2003). Experiential learning in environmental education may, therefore, be intricately tied to the longstanding paradigm of developing an ecological consciousness, or "land ethic" (see Leopold 1949) - where one develops concern for, and takes action on behalf of the environment. Educational theorists posit that student agency is central to this cognitive transformation, shifting the emphasis of learning from curriculum content to the process by which learning occurs (e.g. Apple 1999; McKenna 2003; Stamovlasis 2001).

By personalizing an individual's experience with the physical environment, researchers in environmental education and management suggest that simply "walking the ground" can help the learner develop a richer understanding of, and connection to place (Walck 2003; Weber 2000, 253). A recent study in Britain implemented this approach, employing pre- and post-program surveys to demonstrate how school children's views and uses of river environments had changed - from that of the river as polluted, neglected, and dangerous to that of a site of recreation, fun, and opportunity - after making regular visits to a nearby river (Tapsell *et al.* 2001). This study also illustrated how by engaging students in direct interaction with the river, experientially-based environmental education may contribute to new perceptions and attitudes towards places in the environment.

Because these types of field activities are not mandatory or widespread in mainstream curricula, which vary across jurisdictions, it is often left up to individual teachers, parents, or administrators to initiate these experiential approaches to education in their classrooms and their schools. Yet, "place-based" models for education are strongly advocated in rural schools, which are often identified as having a set of needs that are unique (culturally, socially, economically, and ecologically) to their rural context (Chalker 1999). The teaching about the local aspects of place within school curricula is referred to in the literature as "place-conscious education" (Brooke 2003; Theobald 1997), "place-based education" (Bishop 2003), or "pedagogy of place" (Chalker 1999). One such program has been operationalized in a school in rural Nebraska, USA (see Bishop 2003). This "place-based curriculum" originated out of Paul Theobald's (1997) idea of "place-conscious education," which emphasizes instructing on the importance of intradependence between humans and the environment with respect to relations within a place, thereby

calling for an examination of issues within school curricula and pedagogy through a lens specific to the community or local context. Place-conscious education is based on the assertion that understanding and building upon cultural and environmental relationships that define an individual and his/her community (i.e. what constitutes one's place identity) may fulfill learning objectives in the areas of living well ecologically and economically, developing a sense of civic involvement, a sense of meaning and purpose in a given place, and a sense of belonging to a community (Brooke 2003). Through a curriculum of place, which focussed on three overlapping themes, including i) a preserved native prairie, ii) a protected wetland, and iii) the Platte River Valley of Central Nebraska, students were able to learn how the ecology of their region connected to local industry and agriculture, as well as realizing the practice of citizenship through place-conscious stewardship activities (Bishop 2003). Students used the prairie landscape as an outdoor laboratory for learning, measuring native grasses, collecting soil samples, and specimens of grasses, plants, and flowers for study in the classroom (Bishop 2003). This curriculum involved immersing learners in their community and environment, in an integrated educational context, blurring the boundaries of Biology, with the teaching of English through nature writing, and Art, through the photographing of place.

The theoretical basis for these experiential approaches is also that feelings of attachment that people express toward a particular place "become articulated in and through social interactions" (Johnston *et al.* 2000, 731). Thus, my research is based on the notion that, in addition to learning through first-hand observation, the social aspects of the learning process are also integral to knowledge production. Participatory learning is rooted in social learning theory, which extends the position of constructivist learning to recognize the role of human interaction as central to the learning process. Social learning theory is built on the following four assumptions: i) knowledge is derived through an individual's valued activities; ii) knowing is realized through engagement in these activities; iii) meaning, the ability to experience the world and engage with it, is the definitive outcome of learning; and iv) humans are social beings, and therefore human relationships are central to the learning process (Stein and Imel 2002, 47; Krasny and Lee 2002).

Much of this work on the social nature of learning relates back to earlier ideas developed by cognitive theorists such as Vygotsky (e.g. 1978), and which were later extended by others (e.g. Lee and Smagorinsky 2000; Smagorinsky 1995; Wertsch 1985;

Wertsch *et al.* 1980). These theorists bring together social and constructivist perspectives into the realm of cognitive development, claiming that:

> Knowledge is temporary, developmental, internally constructed, and socially and culturally mediated. From this perspective, learning is a self-regulatory process of struggling with the conflict between existing personal models of the world and discrepant new insights, constructing new representations and models of reality as a human meaning-making venture with culturally developed tools and symbols, and further negotiating meaning through social activity and discourse (Ball 2000, 230).

The social constructivist framework provides insight into the way knowledge is generated and communicated within a social or cultural group. At its most fundamental level, learning begins on an external social plane, and then moves to an internalized psychological plane (Gredler 1997). The Vygotskian view emphasises that symbolic meaning-making systems such as language and various avenues of visual representations (e.g. photographs, maps, or works of art) are part of this progression, acting to socially mediate the processes of learning and psychological development (Smagorinsky 1995; Vygotsky 1978; Wells 2000, 2001; Wertsch 2000).[2] Work done in this area not only bears implications for how one might think about the organization and sharing of cultural values and practices, but has also been explored further with respect to learning and behaviour in the context of formal education. Bakhtin (1981) and others (e.g. Wells 1998; Wells and Chang-Wells 1992; Wertsch *et al.*1980) have claimed that dialogue between individuals is one of the central tools for knowledge building as each learner interprets, reflects upon (comparing new information to previous conceptions), and responds accordingly to solve problems and advance understanding. In practice, it is through exploratory and collaborative activities that dialogic opportunities for the co-construction of meaning and knowledge may be facilitated, among students, their peers, teachers, and others jointly involved in the endeavour - forms of interaction that are not commonly facilitated in the classroom setting (Wells 2000). An extension of this idea is that the student or "novice"

[2] Vygotsky (1978) uses the terms "tools" and "signs" (or symbols) in reference to those means used by an individual to act externally on the environment (e.g. language) or to act internally on the self (e.g. mental representation and organization of objects and encounters in the environment) respectively.

actively participates in tasks where knowledge is applied, developing his or her own understanding and competency with the guidance of others in the process (such as with practitioners in the community) (Lave and Wenger 1991, 1999; Rogoff 1986; Wells 2001; Wells and Chang-Wells 1992).

In creating educational opportunities that are directed towards building environmental understanding and meanings, the social constructivist perspective also lends insight into how participatory and experiential environmental learning may bridge the practice of community stewardship with the concept of sense of place. This involves learning about the environment in a way that is collaborative and collective as well as inclusive and dialogic, thereby providing a theoretical basis for the development of a learning community (Krasny and Lee 2002; Page and Scott 2001).

2.5 The Concept of a Learning Community

For people belonging to rural communities, the concept of rurality holds many meanings: rural spaces have been described as sites of isolation and identity, and as regions where sense of place and knowledge about the physical environment are central to the sustainability of their communities. In these places, the idea of community is central to people's identity. While the meaning of community has traditionally been used to describe a spatially bounded social network of interacting individuals (Johnston *et al*. 2000), the evolving definition of community has broadened to include social, and/or physical spaces, practices, and identities, which themselves may not be static. Individuals' interests and practices change within a community, and the conditions of the natural environment are also in a constant state of flux, requiring community education and agency for adapting to a dynamic socio-cultural, political, economic, and physical setting (Berkes 2004; Brunt 2001; Liepins 2000; Page and Scott 2001). It is on this shifting terrain of meaning and identity, that a learning community emerges as the symbolic, social, and structural support necessary for building on shared knowledge and meanings. To this end, a learning community also provides a possible framework for building upon individuals' perceptions of themselves, their community, and the local environment.

The concept of a learning community has been applied to work in adult and continuing education (e.g. Stein and Imel 2002) and feminist research in Information and

Communication Technologies (ICT) (e.g. Page and Scott 2001), outside of formal educational boundaries. Page and Scott (2001, 532) use the concept as a way of thinking about how members of a women's ICT project can be invited to use social, physical, and/or virtual space to engage in a shared learning process while respecting the diversity of their knowledge base and in a way that contributes to an action-oriented outcome. In the context of ecosystem management, this conception of a learning community may also surface in the form of community groups linking together across sub-regions or regions to advance joint projects, learn from one another, and to increase their impact (Johnson 1997). Regional learning initiatives that may result from broad-based networking are thought to be useful in serving the dual functions for applying a landscape approach to resource management and scientific enquiry, and for gathering support and involvement from management agencies, organizations, and policy-makers in order to acquire the resources and institutional assistance necessary to sustain community-based initiatives in the long-term (Johnson 1997).

Because schools are the physical spaces that represent one aspect of the material embodiment of *community*, characterized by the meanings, activities, and social interactions that they display (Liepins 2000), I would argue that more formal educational settings also offer opportunities for creating learning spaces and practices that are "dialogic and playful" (Page and Scott 2001, 531), and where learners with diverse backgrounds and interests can come together to be "immersed in the experience, and create shared meaning from that experience" (Stein and Imel 2002, 29). In keeping with the principles of CBEM, the question then is, what objectives need to be met in order to bring schools and their students into this learning community?

Ettienne Wenger (2004) offers insight into this question in his work on what he has coined as "communities of practice" – a conceptualization that shares common ground with the idea of a learning community. Wenger's community of practice identifies the following three target objectives (Wenger 2004, 4):

- *Internally:* Organize educational experiences that ground school learning in practice through participation in communities and around subject matters.

- *Externally:* Connect the experience of students to actual practice through peripheral forms of participation in broader communities beyond the walls of the school.
- *Over the long-term:* Serve the lifelong needs of students by organizing communities of practice focussed on topics of continuing interest to students beyond the initial schooling period.

The community of practice can, therefore, be thought of as a "living curriculum" for the learner (Wenger 2004), or as a "learning curriculum" (Lave and Wenger 1991, 1999). Lave and Wenger (1999) suggest that from the perspective of the learner, this learning curriculum develops out of participation in a community of practice, with the view that the target practice *is* the subject matter, and in consideration of the various relations that connect participants to their institutions and each other. Thus, despite the differences in terminology, all of these philosophies characterize learning as process-oriented as well as participatory and experientially-based, emerging primarily out of more non-conventional approaches to education, including those activities that occur outside the traditional classroom environment.

In the face of growing criticism relating to the authenticity of CBEM projects in rural areas (i.e. the extent to which ecosystem management is truly participatory, and whether conservation priorities remain central to these efforts, in the face of political influences) (e.g. Berkes 2004), I would suggest that collaborative and inclusive approaches to ecosystem management and stewardship be integrated into the everyday practices of educational institutions that are already positioned as sites for learning in rural communities. Schools in rural communities have long been recognized as centres for the networking of agencies, institutions, and other interest groups committed to meeting the needs of the community and expanding learning opportunities (Decker 1992a; 1992b). The school curriculum can be made comparatively consistent in the context of a changing rural landscape, providing opportunities for longer-term stewardship projects and social relationships that foster mutual learning – both for adults and young people.

2.6 Making Linkages

A review of the literature reveals that commonalities exist between environmental education, CBEM and stewardship, sense of place, and learning communities, and that there is a need to bridge these areas together in the way we think about learning from, and managing the environment.

Little research in the field of CBEM has examined environmental learning outcomes that may result from participating in stewardship activities. In environmental education literature, school and community-based stewardship projects have been largely overlooked as a means for participatory and experiential learning. In cases where environmental education is applied in the context of ecosystem management – sometimes coined "critical environmental assessment education" – it is designed to help prepare local residents for greater involvement in environmental planning and management (see Diduck 1999; Diduck and Sinclair 1997). These education programs cater to adult involvement, under the pretence of being democratic. There is a marked absence of youth in these processes. This omission is surprising in light of the importance placed on the idea of participation in environmental education, particularly since the creation of the Agenda 21 plan for environmental action in 1992 (United Nations 1992). This gap is also seen in CBEM, where participation and democracy are themes that permeate throughout current discourse. Other researchers have responded to this disconnect, calling for constructive and relevant environmental education programs that create space for reciprocity and dialogue (e.g. Matthews and Limb 1999). They argue that youth have a legitimate right as citizens to be included as equal participants in the decision-making processes that affect their local environments. This rationale is further grounded in observations that local places are important to individuals, affording "personal development through effective use of local resources and civic and social belongingness through participation" (Matthews and Limb 1999, 60). Creating inclusive opportunities for experiential and participatory environmental learning through stewardship activities illustrates how some of the outstanding issues for environmental education and environmental management can be bridged to accommodate their common interests for participation.

Another common strand tying stewardship and environmental education together is the importance of sense of place. In the context of environmental management, there is a recognition that local knowledge and culture, values and identity are also important in the

management and maintenance of ecosystems, particularly in cases where local values are often disparate from those held by environmental "specialists" (e.g. Slocombe 1998). Similarly, in other disciplines (e.g. environmental psychology and rural sociology) sense of place is examined in reference to how one sees and relates to their surroundings, but without commentary as to how these perceptions relate to learning. Thus, there is a need for a two-pronged approach to assessing the connection between sense of place and environmental learning: first, to understand how place is defined for people, as an influencing factor in how a learner might be affected through their experience of participating in a stewardship or environmental education program; second, to create experiences that act on sense of place, with the assumption that these meanings will contribute to new attitudes towards, and values for the environment.

Bringing together schools, community members, and researchers into a local stewardship project may be both a way to include youth in CBEM, as well as one way to integrate social and experiential aspects of environmental learning into school curricula, and to build on sense of place. Incorporating a school-based stewardship project in the context of a larger learning community could change the way we think about approaching environmental education – as experiential and participatory, presenting opportunities for shared learning experiences, deeper meanings and the development of new environmental attitudes.

In the next chapter, I set the context for this work by introducing the economic, environmental, and cultural characteristics of the two participating communities, highlighting what prompted the FRBP to carry out its activities in the region, and describing the evolution of the project from its conception to its implementation. Finally, I also outline the methodological approach that I adopted in evaluating the program's impact on participants.

CHAPTER 3: STUDY AREA AND METHODOLOGY

3.1 Background to Study Area

The Frenchman River Basin is located in the Southwestern corner of Saskatchewan and includes the rural communities of Eastend (located in the Rural Municipality of White Valley, No. 49) and Val Marie (situated in the Rural municipality of Val Marie, No. 17) (see Figure 3.0.). The watershed encompasses native prairie and cropland, the majority of which falls within the Mixed Grass Ecoregion, with the westernmost area (immediately west of Eastend) comprising the Cypress Upland Ecoregion (Saskatchewan Environment 2000). Similar to other rural areas within the Province, both Eastend and Val Marie are experiencing depopulation. The population of the town of Eastend is 576, having declined by 20 percent since 1981 according to the 2001 Census (Kennedy and McMaster 2003). During the same time period, the population of the village of Val Marie fell by 44 percent to 134 inhabitants (Kennedy and McMaster 2003). This trend is also observed more broadly within the region, where the 6805.8 square kilometre watershed has experienced a net loss of 25 percent of its population, leaving fewer than 6,000 people to sparsely populate this vast area in the southwest of the province (Kennedy and McMaster 2003).

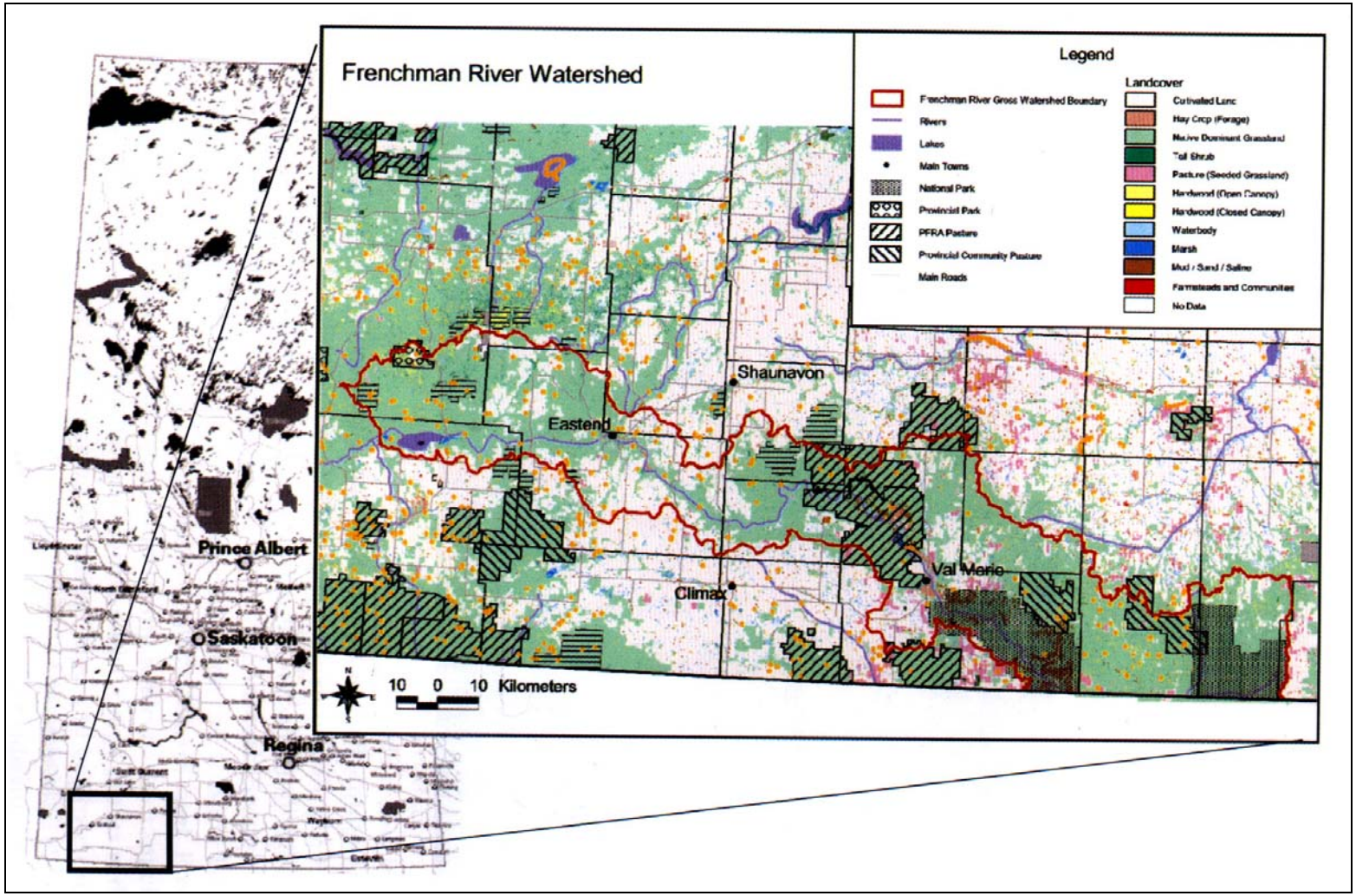

Figure 3.0: Frenchman River Watershed, including the communities of Eastend and Val Marie, as well as land use and land-cover types (Source: Kennedy and McMaster 2003).

Primary industry represents over one-half of all employment in the region (Statistics Canada 2001). In Val Marie and Eastend, including their surrounding municipalities, nearly three quarters of residents are employed in agriculture (dry land farming and ranching), highlighting the importance of this sector to the local economies (Kennedy and McMaster 2003). Oil and gas reserves are also found in the area (Government of Saskatchewan 2006), although they are not a significant source of employment for local people.

Loss of people from this region has dramatically changed the face and the character of the rural landscape. There are trends towards the centralization of wheat pools, changes in the transportation of agricultural goods, and more recently in 2006, the amalgamation of rural School Divisions. In the 2004/2005 school year and at the time of my field work, the student population at Eastend School was 144 and formed part of the Eastend School Division #8 (located in the Town of Eastend), which was responsible for 471 students in the area (Saskatchewan Learning 2005a). Val Marie School had 54 students and was part of the Shaunavon School Division #71 (located in the Town of Shaunavon), in which a total of 693 students were enrolled (Saskatchewan Learning 2005a). It is noteworthy to mention that as of January 2006, the Divisions of Eastend and Shaunavon became 2 out of the 9 divisions that amalgamated into the new Chinook School Division #211, which include 6,829 students from across Southwestern Saskatchewan (Saskatchewan Learning 2005a). Accompanying these administrative changes, and with the relocation of the head office to the City of Swift Current, community members in Eastend and Val Marie that were previously serving on local school boards will no longer serve in an advisory capacity (Eastend School Division 2005).

In light of the current trends of depopulation and economic decline within the agricultural industry, tourism is becoming increasingly important to the local economies in these communities (Sutter *et al*. 2005). The Royal Saskatchewan Museum's palaeontological research and education centre in Eastend, named the T-Rex Discovery Centre, opened in 2000 accompanying the fossil discovery of the now famous Tyrannosaurus-Rex, "Scotty." This centre now serves as one of many significant tourist attractions in the Frenchman River Valley (see Figure 3.1) (Government of Saskatchewan 2005). The town of Eastend is also known for maintaining the former home of the

renowned novelist, Wallace Stegner, who captured the nature of the prairie setting in his works. The Stegner house now serves as a retreat for aspiring artists and writers from across the country (Eastend Arts Council 2004).

Figure 3.1: The T-Rex Discovery Centre (left), overlooks the Frenchman River Valley and the Town of Eastend (right).

Eastend, Val Marie, and the surrounding landscape are places that are unique in culture, rich in history, and biologically important. Marking the northern extent of the North American Great Plains, the region once supported herds of wild bison. Bison drive lanes, campsites, tipi rings, and other cultural artefacts are still visible on farms, ranches, and in parks within the Frenchman River Valley (Parks Canada 2005). Examples of such sites include the 1871-73 trading post of the Hudson's Bay Company and later the post of the Northwest Mounted Police at Chimnee Coulee (near Eastend) (Eastend Community Tourism Authority 2004), and the camp where Sitting Bull sought shelter after the battle of the Little Bighorn in 1876 (near Val Marie) (Parks Canada 2005). People in neighbouring communities still tout Val Marie as one of the last frontiers of the "wild west," in reference to the community's more traditional farming and ranching culture. Val Marie is also a gateway community to Grassland's National Park (GNP) (see Figure 3.2) – 497.3 square kilometres of preserved mixed prairie grassland (Parks Canada 2005), and the first of its kind in Canada. Grasslands National Park was established in 1981 and was officially proclaimed a national park under the Canada National Parks Act in 2001

(Parks Canada 2005).[3] The park has been growing slowly ever since, both in land area within the management planning boundary and in the number of people it attracts, drawing approximately 6,000 visitors each year (Kilfoyle 2006).[4] Both the Visitor Reception Centre and the Park's office are located in the Village of Val Marie. Grasslands National Park also has an active research program that focuses on the study of native wildlife and plant species, including species deemed to be of special concern or endangered by the Committee on Endangered Wildlife in Canada, such as the black-tailed prairie dog, the greater sage grouse, the burrowing owl, and the swift fox.

Figure 3.2: The Village of Val Marie, portrayed as the "gateway" to Grasslands National Park.

Eastend and Val Marie rely on the Frenchman River for their water supply. Because water availability has been variable in some years, water reservoirs and irrigation projects are used to allocate water for agricultural and domestic use, as well as

[3] Under the Canada National Parks Act (Department of Justice Canada 2000, c.32), national parks are "dedicated to the people of Canada for their benefit, education and enjoyment…to be maintained and made use of so as to leave them unimpaired for the enjoyment of future generations."

[4] The planned boundary for Grasslands National Park includes expanding the currently protected area of 497.3 square kilometres to 900 square kilometres of land, as set out in the Park's management plan (Parks Canada 2005). This land is located in both the East and West blocks along the Canada - U.S. border. It is worth noting that GNP was also Canada's first National Park to be created in 2 blocks with extensive private land holdings located in each block, and with plans to "infill" from the time of proclamation. Land is acquired by GNP on a willing-seller, willing-buyer basis, as it becomes available (Parks Canada 2005).

to ensure that flow commitments to the United States are met. Because of this watershed's varied prairie habitat (PCAP Partnership 2003), the importance of water quality and flow for local farming and ranching, and the possible threats of these land use activities on water quality and biodiversity, Southwestern Saskatchewan has been the site of recent conservation efforts by government agencies, university institutions, and other interest groups. Such conservation initiatives, including the creation of Old Man on His Back Prairie and Heritage Conservation Area in the west (see http://www.natureconservancy.ca), the establishment of Grasslands National Park (GNP) in the east, and new regulations under the Species at Risk Act (passed in 2002), have contributed to growing tensions between government agencies and local residents regarding the lack of control in research and resource management decisions by local residents in communities in the Frenchman River Basin.[5] In the view of some researchers, ranchers alone can be credited for contributing to the preservation of these large, intact areas of native prairie and the wildlife it supports (e.g. Kennedy and McMaster 2003; Sutter *et al*. 2005). However, from the perspective of primary producers in the area, recent efforts to conserve biodiversity and protect habitat have been a source of much unwanted attention. The reaction of landowners to this attention could arguably undermine these conservation efforts. For example, agricultural producers commonly espouse an attitude of defiance with respect to their own sighting of endangered species on their land - as demonstrated by the harsh words "shoot, shovel, and shut-up" that are frequently heard on local farms and ranches (Bell and Reed 2003). As a result, many groups working with local farming and ranching communities increasingly recognize the importance of civic involvement in these conservation initiatives, at the level of both decision-making and stewardship.

[5] The purpose of the Species at Risk Act (Department of Justice Canada 2002, c. 29) is "to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened" (see http://laws.justice.gc.ca/en/S-15.3/text.html 2002). The Act provides legal protection for these species and the conservation of their biological diversity, while making it an offence to damage or destroy their habitat on all lands of federal jurisdiction (under sections 32 and 33). This legislation also applies to private lands (under section 34), in such cases where an order has been recommended by the Federal Minister of Environment.

3.2 Setting the Context: The Frenchman River Biodiversity Project

Competing interests for social, economic, and environmental sustainability prompted the Frenchman River Biodiversity Project (FRBP) - a research alliance consisting of several local community members and academic researchers (representing the Canadian Museum of Nature [CMN], the Royal Saskatchewan Museum [RSM], the University of Alberta, the University of Saskatchewan, and the Centre for Rural Studies Enrichment [CRSE]) who are committed to assessing the health of the Frenchman River through an interdisciplinary study of water quality, aquatic biodiversity, and social sustainability in the region (see Figure 3.3 for the organizational structure of the FRBP) (Sutter *et al.* 2005). These objectives were also viewed as being particularly important because very little ecological data on the Frenchman River had been acquired until that time.

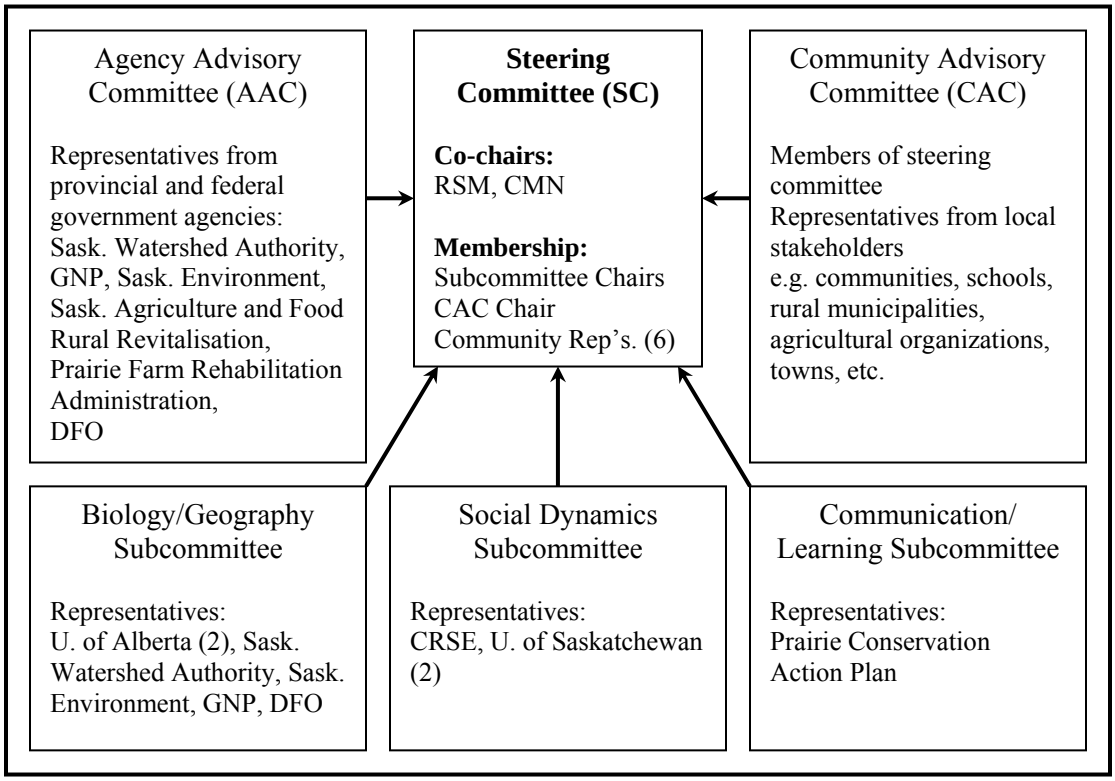

Figure 3.3: Committee structure of the Frenchman River Biodiversity Project (Source: adapted from Sutter *et al.* 2005).

The FRBP is a CBEM initiative, modelled after the 1998-2000 Rideau River Biodiversity Project in Eastern Ontario - a watershed study designed to assess the biodiversity and water quality of the Rideau River. This Ontario study involved the Regional Municipality of Ottawa-Carleton and the Canadian Museum of Nature together with local communities, working in close cooperation to ensure the river's longer-term sustainability (CMN 2006; Sutter *et al.* 2005). The FRBP was initiated in the summer of 2003 and is set be carried out into 2006. The project received its funding from a variety of sources, including the Salamander Foundation, the EJLB Foundation, Saskatchewan Heritage Foundation, Parks Canada, and Environment Canada's Canada Science Program.[6] Part of the FRBP's agenda included equipping local residents with the tools and resources necessary to maintain the health of the Frenchman River, beyond the finite 3-year time frame of the project. More specifically, partners of the FRBP envisioned the development of an autonomous, community-based stewardship group that would be able to continue carrying out local monitoring of the Frenchman River and promote environmental awareness, once outside partners were no longer actively involved.

This project has encountered numerous socio-political challenges throughout its development to date. Early in its conception, the FRBP met significant resistance from local residents, relating to concerns over federal legislation designed to protect species at risk. During community meetings held in both Eastend and Val Marie to discuss and garner support for the project, local residents expressed strong opposition. The project was described as "just one more" ecosystem study, the results of which could potentially threaten the freedom, day-to-day practices, and livelihood of local people (e.g. by restricting cattle from directly accessing waterways). Nevertheless, local people voted by clear majority to allow the project to proceed. As an outcome of the concerns expressed at these meetings, the steering committee agreed to ensure the anonymity of landowners and to exclude their property locations in the publication of data as well as to restructure the committee to include at least 50 percent local representation. This change, in theory, brought the project closer to principles of CBEM (see Figure 3.3 above) (Sutter *et al.* 2005). Because of the communities' previous "bad experiences" in dealing with

[6] At the request of its founders (who wish to remain anonymous), the EJLB foundation, which supports environmental scientific research, is not known by any other name (see http://www.ejlb.qc.ca/).

government agencies, the Steering Committee also elected not to have any government representatives on their committee (see Figure 3.3 above). Rather than being active participants in the planning process, people representing these agencies (such as Saskatchewan Environment, Department of Fisheries and Oceans [DFO], and local GNP Staff) were invited to attend some meetings of the Steering Committee as observers only, regardless of whether some of these individuals were long-time residents of the local communities and stakeholders interested in having more input into the project.

In the second and third years of the project, attendance at community meetings hosted by the FRBP waned (sometimes drawing only a few local residents, as compared to initial turnouts of up to 30 people), despite the committee's efforts to increase communication and establish greater trust between the FRBP and local communities.

The timeliness of the FRBP in light of conflicting interests for land use and conservation in the area, coupled with the steering committee's goals to include local schools in data collection activities presented a unique and mutually beneficial opportunity to work in partnership with the FRBP committee members. Through this Master's research, students could be included in ecological monitoring of the Frenchman River, as members of a learning community, while enhancing community participation in the larger project.

3.3 Development and Implementation of the Ecological Monitoring Program

Canada's Ecological Monitoring and Assessment Network (EMAN 2003, 4) has defined community-based ecological monitoring as "a process where concerned citizens, government agencies, industry, academia, community groups and local institutions collaborate to monitor, track, and respond to issues of common community concern." The ecological monitoring program that I describe in this thesis was fundamentally a community-based initiative; it was carried out with, and for, local people.

This project began in the spring of 2004. It involved collaborating with participating teachers in Val Marie and Eastend Schools to develop a program that could meet goals for both education and stewardship and could be sustained beyond the timeframe of my own research project. At the same time, the initial goal was to bring together students and teachers from participating schools to work jointly, and in co-

operation with members of the FRBP, in order to broaden the impact of the ecological monitoring program by advancing ecosystem stewardship and scientific knowledge relating to the health of the Frenchman River, at the watershed level. Data that student researchers collected in the first year of the monitoring program were included in the larger FRBP study of ecosystem health. These data also represented the first entry into a database of water quality and biodiversity information - to be maintained by science students in successive years - for monitoring environmental changes in the Frenchman River. In this way, Eastend and Val Marie Schools would serve as centres for learning about the local environment, as well as sites for environmental stewardship.

The initial component of fieldwork involved spending time in Eastend and Val Marie, including regular informal meetings in the late spring and summer of 2004, prior to the ecological monitoring program. This time was directed to conferring with FRBP members, establishing rapport with teachers and community members, and identifying school needs and interests for monitoring, as well as the social context within which the program and my research would be carried out.

Monitoring equipment, including digital cameras, topographic maps, and other items not currently held by the schools, was purchased with a Social Sciences and Humanities Research Council (SSHRC) grant made available through another research project at the University of Saskatchewan (Bell and Reed 2003). The FRBP provided water quality test kits as well as a field guide that was used by students to help them in their identification of invertebrates. This field manual, entitled "Quick Guide to the Major Types of Freshwater Invertebrates in the Frenchman Watershed" (Proctor 2004) was developed by a biologist working with the FRBP at the time, and based on biological data collected from the river basin the year prior. The resources and tools that were acquired or developed through this project, including a preliminary curriculum document for ecological monitoring, would remain in local schools for their future use.

Grade 10 students from Eastend School and grade 9/10 students from Val Marie School participated in program activities as a unit in their science curricula.[7] As shown in Table 3.0, the design of the ecological monitoring program was consistent with the aims and goals set out by the Ministry of Saskatchewan Learning, in the Science 10

[7] Due to reduced class sizes in Val Marie, science is only offered as a grade 9/10 combined class.

Curriculum Guide (1991), as well as the recently revised (2005c) Science 10 curriculum. The revised Science 10 curriculum focuses on developing student knowledge, skills, and attitudes in scientific enquiry, in the context of the "sustainability of ecosystems," which emphasizes teaching about the biodiversity of local ecosystems as a key subject area.[8]

[8] The relevant core-teaching units in the Science 10 curriculum have changed, from "water quality" in the 1991 document (which was in use during my field work), to the "sustainability of ecosystems," in the new 2005 guide. Despite these modifications, the content shares similar teaching principles and objectives. It is also worth noting that the activities incorporated in the ecological monitoring program are consistent with the content of most secondary school level science and biology curricula (Saskatchewan Learning 2005b, see also http://www.sasked.gov.sk.ca/branches/curr/evergreen/science.shtml). The program can also be adapted as a cross-curricula theme, integrating elements into creative writing, social studies, and fine arts classes.

Table 3.0. Compatibility of ecological monitoring program with educational objectives presented in Saskatchewan Learning, Science 10 Curriculum Guide.

Corresponding Curriculum Foundations	Compatibility with Ecological Monitoring Program
Foundation 1: Science, technology, society, and the environment	
Nature of science and technology	✔
Relationships between science and technology	✔
Social and environmental contexts of science and technology *(e.g. science to inform and empower decision making by individuals, communities, and society)*	✔
Foundation 2: Knowledge	
Life Science *(e.g. the study of ecosystems, biological diversity, and organisms)*	✔
Physical Science *(e.g. chemistry)*	✔
Earth and Space Science	✔
Foundation 3: Skills	
Initiating and planning *(e.g. questioning, identifying problems, and developing preliminary ideas and plans)*	✔
Performing and recording *(e.g. carrying out a plan of action, gathering evidence by observation, and manipulating materials and equipment)*	✔
Analyzing and interpreting *(e.g. examining information and evidence, processing and presenting data so that it can be interpreted, and interpreting, evaluating, and applying the results)*	✔
Communication and teamwork *(e.g. teamwork skills, collaboration)*	✔
Foundation 4: Attitudes	
Appreciation of science	✔
Interest in science *(e.g. enthusiasm and continuing interest in the study of science)*	✔
Scientific inquiry *(e.g. attitudes that support active inquiry, problem solving, and decision making)*	✔
Collaboration *(e.g. attitudes that support collaborative activity)*	✔
Stewardship *(e.g. responsibility in the application of science and technology in relation to society and the natural environment)*	✔
Safety	✔

(Source: Adapted from Saskatchewan Learning 2005c; available on line at http://www.sasked.gov.sk.ca/docs/pdf/science_10_2005.pdf)

In Eastend, program activities began in early September and were integrated into regular scheduled, 55-minute science classes over a 4-month period (refer to Table 3.1,

page 43). Although not all this time was dedicated to the program alone, project-based learning is time intensive and was a largely new approach to science education for the participating teacher and students. The teacher worked to prepare students for the activities, providing them with some background information about the local ecology of the watershed and a review of water chemistry. A local representative of the FRBP was also invited to speak to students about the larger biodiversity study and students' own contributions to it. Within the two weeks leading up to the field trip, I introduced students to new concepts such as "biodiversity," "stewardship," and "citizen science," and demonstrated how to use some of the more technical equipment, including compasses, global positioning system (GPS) devices, and digital cameras. During this time I also provided them with an overview of water sampling procedures and safety protocols that they would follow once in the field.

The half-day field excursion took place in mid-September. Students were taken by bus to three sites along the Frenchman River, in and near Eastend. These sites were selected by the teacher, based on her own knowledge of the area. Here, students worked within their established research teams to collect water samples and aquatic invertebrates, examine stream flow, river morphology, water chemistry (including pH, alkalinity, total dissolved oxygen, nitrates, phosphates, the presence of coliform bacteria, and temperature), as well as to develop a photo record of the riverbanks (see Appendix A for the field trip schedule of activities and a sample of activity instructions). These data collection methods were adapted from existing protocols that have been developed by Alberta RiverWatch (2005), a school-based initiative for monitoring river ecosystems at the secondary school level.[9] In the afternoon, students returned to the classroom and spent the remainder of the day counting and identifying micro- and macro-invertebrates that they had collected – a task that they continued for approximately 4 weeks. This information was compiled and entered into an excel spreadsheet that formed their database of water quality and biodiversity information about the Frenchman River.

[9] The goals of Alberta RiverWatch include advancing environmental stewardship within Alberta's schools by engaging students in outdoor, field activities, where they monitor the health of local rivers by examining and tracking aquatic invertebrates, water chemistry and bacteria present (Alberta RiverWatch 2005).

In Val Marie, there was much less input into the design of the program from school collaborators. Rather, the earlier experiences that had been gained from its implementation in Eastend School were carried through to Val Marie, which included the decision to reduce the length of some in-class activities in order to sustain student interest. Factors such as research timing constraints, as well as the school's role within the FRBP (which is discussed in detail in Chapter 4) also contributed to this decision. The program format included several hours of class time - an abridged version to that which took place in Eastend. Fewer water samples were taken from each site during the field trip, and less time was spent on program preparation and follow-up activities. As a result, students employed less rigorous analysis of their data.

In both schools, teachers integrated ecological monitoring activities into their classroom exercises in order to fit their own educational objectives and teaching styles. For example, the science teacher in Eastend asked students to work together to produce a final report that included an assessment on the health of the Frenchman River based on their own findings from the water and invertebrate samples analysed during the program. Alternatively, in Val Marie, the science teacher initiated a role-playing exercise, wherein students had to take a position in a public water resource management debate, drawing from the knowledge that they acquired through their own river monitoring exercises. These students were later evaluated based on a hands-on, practical exam where they had to demonstrate the skills they had learned for water quality monitoring and invertebrate identification at stations set up in the classroom.

In Eastend School, as a culminating activity and as a way of disseminating project information locally, I asked the science 10 students to make a photo mural display. Students selected photographs that they had taken of those things that were meaningful to them in and around community, as well as pictures that had been taken of their ecological monitoring activities, and then superimposed them on a topographic map of the Frenchman River Valley. Students also identified their monitoring sites on this display. In creating this photomural, students were integrating aspects of what they liked about their region and their stewardship work into a local, geographic context. The concept of "bioregional mapping" is based on the idea that bringing together cultural and physical boundaries or elements of one's home place onto a map in a holistic and creative way can be an avenue for learning about, and helping to connect people to those places (e.g.

Harrington 1999). This photomural was on display at the school, the local Credit Union, and in the Eastend School Division office for the community to view. Students also used this display at Eastend School's annual "muffin morning" event, where they were able to share some of their experiences and monitoring information with interested parents.

Schools gave the FRBP and myself permission to share their experiences publicly by contributing to the school-based monitoring protocols and activities of other community groups interested in ecological monitoring in Canada. For example, students' activities were presented in the on-line issue of the EMAN Monitor (see Sutter *et al.* 2005),[10] and curriculum materials developed out of the project work were also provided to Biosphere's Adopt-a-River Program in exchange for their resource guides. In addition, students monitoring activities were reported in the "Biodiversity Update," a biannual newsletter of the FRBP that was distributed widely within the region with the purpose to keep residents informed of research findings and project activities.

3.4 Research Design

In this research, I employ a case study methodology in the communities of Eastend and Val Marie. A case study methodology is the preferred method in ecosystem management research (e.g. Diduck 1999; Olsson and Folke 2001; Moote *et al*. 2001; Stein *et al.* 1999) and education research (Charles 1998; e.g. Vaughan *et al*. 2003), as it allows for the examination and explanation of observed real world phenomena, within a system bounded by time and place (Creswell 1998). Within this framework, I also adopt a more phenomenological approach in the analysis and discussion of the meaning behind students' lived experiences, particularly in order to unravel how they construct

[10] The EMAN Monitor is an electronic newsletter that showcases the work of the partner organizations and groups that make up the Ecological Monitoring and Assessment Network. The purpose of the newsletter is to provide a forum for "the sharing and exchange of ideas and activities" in order to help build linkages between participants and enhance the effectiveness of ecological monitoring in Canada (Environment Canada 2005, no page number available). The newsletter reaches agencies, groups and individuals involved in or affiliated with ecological monitoring in universities, government, education centres, and non-governmental organizations, as well as the general public (Environment Canada 2005).

knowledge of their environment and derive meanings of place through their experiences participating in the ecological monitoring program.

This project is grounded in principles of "action research" (see Cornwall and Jewkes 1995; Guevara 1996; Kesby *et al.* 2003; Pain and Francis 2003; Rearick and Feldman 1999; Fals-Borda and Rahman 1991) and "project-based research" (e.g. Stoecker 2005), which in their design, are participatory approaches that are about "working *with* rather than *on* people," and which emphasize the value of the research process in contributing to positive change in the lives and communities of the research participants (Kesby *et al*. 2003, 144). The assumption is that the experiences and observations that are made through students' participation in the monitoring program may expand current knowledge of biodiversity and water quality of the Frenchman River as well as contributing to the development of local techniques for ecosystem stewardship. The program may also serve as a model for participatory and experientially-based approaches to environmental education, which could be applied in similar socio-political and ecological contexts. Furthermore, the objective of this program includes contributing to transformative learning among participants, with the assumption that students' engagement in an ecological monitoring program may facilitate the development of new perceptions of, and attitudes toward their environment, as well as practices for ecosystem stewardship. Finally, I believed that the participation of students and teachers could, in the short term, enhance their opportunity for voice in the larger FRBP, and in the long-term, serve as a springboard for the formation of a local, independent stewardship group.

3.5 Data Collection

3.5.1 Overview

In this research, I employ a mixed methods approach to evaluate the role of the ecological monitoring program in promoting sense of place, raising environmental awareness, and in the development of a learning community. As shown in Figure 3.4, quantitative data were derived through knowledge-based tests. Qualitative data were obtained from multiple sources, including interviews, photographic diaries, other textual material completed by students as part of their course curricula, as well as field notes made in the observation of participants during the course of my fieldwork.

My sampling design was composed of a combination of purposeful and snowballing techniques (Creswell 1998). Local representatives on the FRBP steering committee who held "insider status" within the communities of Val Marie and Eastend, served as key informants or "gatekeepers," and helped me to identify teachers that they thought may be interested in participating in the project (Creswell 1998, 117). I then left the selection of appropriate classes up to the discretion of the teachers. In Eastend, the Grade 10 class was chosen to participate because the teacher felt that the ecological monitoring program would best fit with the Grade 10 science curriculum, as well as with this particular group of individuals. As a result, these 10 students then became the central participants in my study, as they provided perspectives of their experiences through interviews. This study sample consisted of 8 females and 2 males, ranging from 15 to 16 years old at the time of the fieldwork. It is worth noting that while factors such as age and gender likely influenced these participants' understanding of place, and their perception of the program, a comprehensive social psychological analysis of the relative impact of age and gender is beyond the scope of this thesis.

As shown in Figure 3.5, I also chose to interview participating teachers, the principal at Eastend School, as well as an FRBP committee member in order to gain additional insight into students' experiences, learning outcomes, and the overall success of the program, as well as to obtain data relating to my examination of a learning community.

As shown in Table 3.1, my fieldwork may be broadly divided into "pre-program," "field trip/post-program," and "follow-up" phases, during which time, key monitoring and research activities were conducted. Before commencing this work, I received approval from the Behavioural Research Ethics Board at the University of Saskatchewan. I also obtained written permission from both the Eastend School Division and the Shaunavon School Division. It is also important to note that in addition to obtaining signed consent from interviewees, before finalising this thesis I received further permission to include statements from those individuals whose comments are tagged to them in a way that compromises their anonymity.

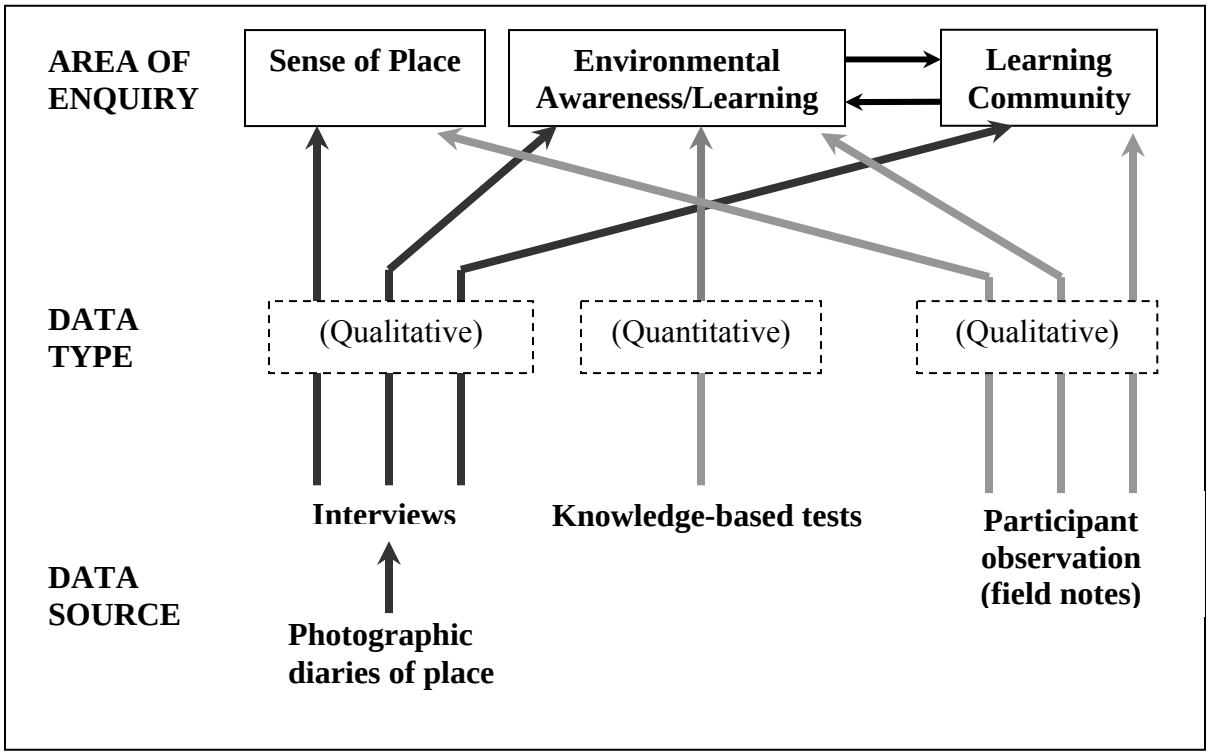

Figure 3.4: Data collection and organization.

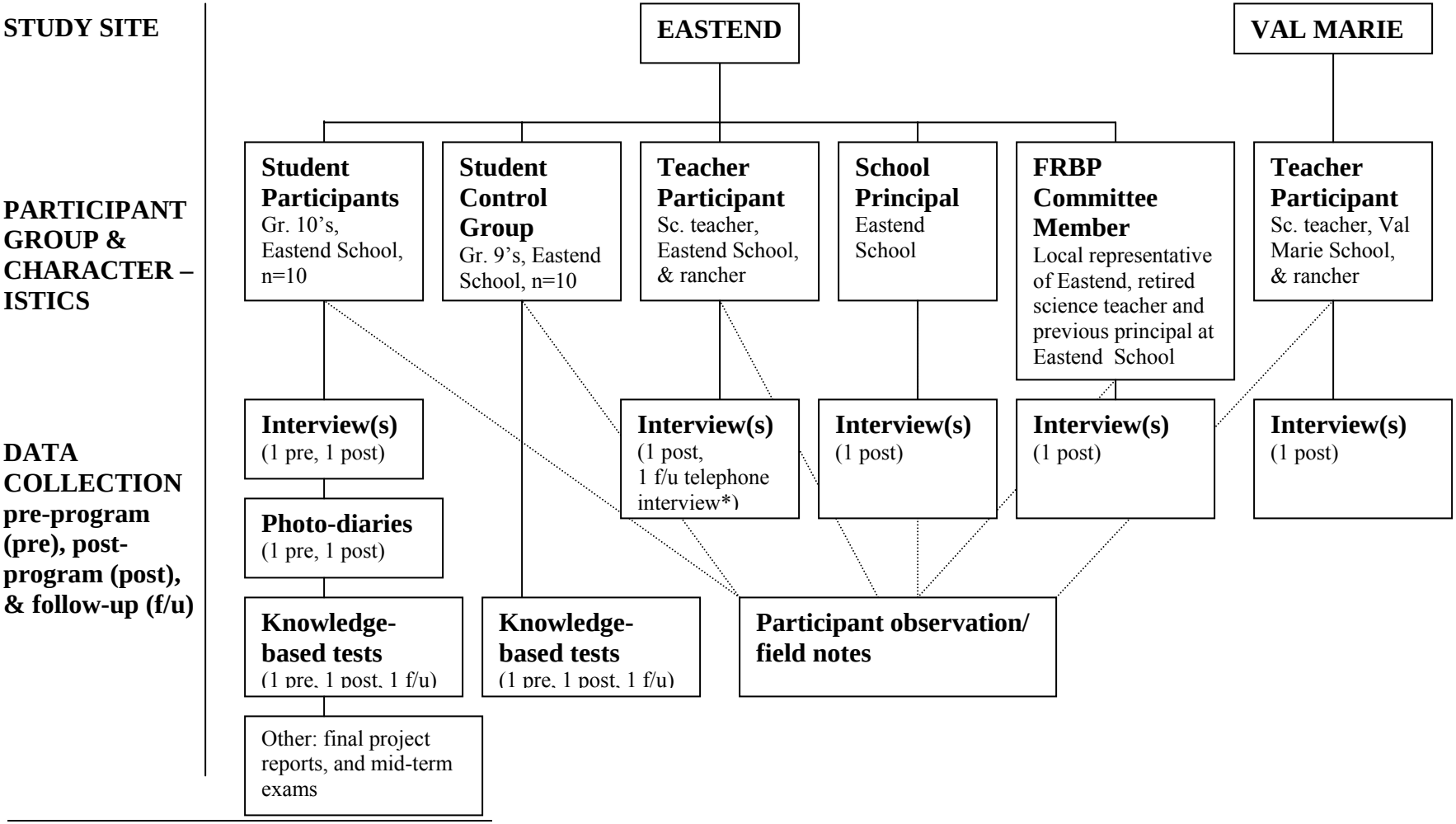

Figure 3.5: Research participants and data collection types.
*All interviews were conducted in a face-to-face setting and taped unless otherwise indicated.

Table 3.1. Timeline for fieldwork: data collection and program implementation.

	Eastend	Val Marie
PHASE 1: PRE-PROGRAM		
Knowledge-based tests (pre-program)	▪ *Science 10/participating group*: Tuesday, August 31st, 2004 ▪ *Science 9/control group:* Wednesday, September 1st, 2004	–
Photo-diary Assignment (pre-program)	▪ Wednesday, September 1st, 2004 (assigned) to Tuesday, September 7th, 2004 (returned).	–
Interviews* (pre-program)	▪ *Student Participants EE:* Tuesday, September 7th, 2004 to Thursday, September 9th, 2004	–
FRBP Logo Design Contest	▪ *Grades 8/9 EE*: Thursday, September 9th to Monday, December 10th, 2004.	▪ *Grades 9/10 VM:* Tuesday, October 12th to Friday, December 10th, 2004
Pre-Program Activities ▪ **Introduction to Master's research project and ecological monitoring program**	September 1st to 15th, 2004 ▪ Wednesday, September 1st, 2005 (Career and Work Exploration's Class)	October 12th, 2004 –
▪ **FRBP representative as guest speaker:** Background information on FRBP	▪ Thursday, September 13th, 2004	▪ Tuesday, October 12th, 2004 (2hr. class)
▪ **Preparation for field trip** (GPS/compass presentation etc.)	▪ Monday, September 13th & Wednesday September 15th, 2004	▪ Tuesday, October 12th, 2004
PHASE 2: FIELD TRIP/POST-PROGRAM		
Field-trip Activities ▪ **Field excursion**	Sept. 17th to October 15th, 2004 ▪ Friday, September 17th, 2004	October 25th to 26th, 2004 ▪ Monday, October 25th, 2004
▪ **Completion of water chemistry analysis, invertebrate identification, & data entry** (See Appendix A for field trip schedule and sample of monitoring instructions for the collection of aquatic invertebrates)	▪ Tuesday, September 21st, 2004 to Friday, October 15th, 2004	▪ Tuesday, October 26th, 2004
	Other: project reports, mid-term exam (written), final essay (up to December 2004)**	Other: Role playing exercise, unit examination (practical) (up to November 2004)**
Interviews* (post-program)	▪ *Student Participants EE:* Thursday, September 28th, 2004 to Wednesday, October 5th, 2004 ▪ *Teacher Participant EE:* Thursday, October 21st, 2005	▪ *Teacher Participant VM*: Friday, December 10th, 2004.

	▪ *Principal EE: Thursday, October 21st, 2004* ▪ *FRBP Steering Committee Representative EE:* Thursday, September 30th, 2004	
Photo-diary Assignment (post-program)	Tuesday, September 21st, 2004 (assigned) to Tuesday, September 28th, 2004 (returned).	–
Knowledge-based tests (post-program)	▪ *Student Participants EE/ Science 10:* Friday, November 5th, 2004 ▪ *Control Group/Science 9:* Wednesday, December 8th, 2004	–
PHASE 3: FOLLOW-UP		
Program wrap-up activities	▪ Creation of photo-mural display and participant lunch: Friday, October 15th, 2004	–
Interview (follow-up)*	▪ *Teacher Participant EE:* Tuesday, February 8th, 2005 (telephone interview)	–
Knowledge-based tests (follow-up)	▪ *Student Participants EE (Science 10)*: March 7th, 2005 ▪ *Science 9/control group:* February 28th, 2005	–
Dissemination of Information (Refer to Section 4.4 [Table 4.2] for a more comprehensive description of other dissemination activities)	School Reporting: ▪ School newsletters (EE and VM, September and December 2004) ▪ Presentation of research findings Board of trustees at Eastend School Division Meeting (March 9th, 2004) ▪ Presentation of research findings to Science 10 class EE (March 9th, 2005) ▪ Photo-mural display at Eastend School's "Muffin Morning" (Thursday, October 21st, 2004; also displayed at the local Credit Union office and the Eastend School Division Office) Community Meetings: Presentations at FRBP Community Meetings, Eastend & Val Marie (March 10th, 2004)	

Note: Highlighted cells show data collection activities, all other cells indicate activities that related to the ecological monitoring program.
* Unless indicated otherwise, all interviews were conducted in a face-to-face setting.
** Not all class instruction/assignments related to the ecological monitoring project (such as mid-term exams, essays, and final project reports) are indicated in the above schedule of activities.

3.5.2 Knowledge-Based Tests

Multiple choice, knowledge-based tests were implemented before and after the ecological monitoring program to quantitatively determine whether the program affected students' environmental awareness (refer to the knowledge-based test included in Appendix B). The use of the "two-group pre-test - treatment - post-test design" to evaluate student learning outcomes is a preferred analysis tool in education research, particularly for assessing knowledge acquisition that may attributed to a specific program, event, or activity (e.g. Tapsell *et al.* 2001), and because it helps to reduce potential sources of error (e.g. Charles 1998). The pre- and post-test design addresses the latter issue by providing an initial comparison from which to base any improvements in scores following the monitoring program, and provides an initial measure of equivalence between two test groups. The Grade 9 science class from Eastend served as the control group to validate this pre- and post-test approach. This separate group did not partake in program activities; however, students did complete the knowledge-based tests within time periods similar to that of the Science 10 class from Eastend, which was directly involved in the monitoring program. It is important to note that due to differences in scheduling and in timing of curriculum content in each science class, the tests could not be administered on the same day. Knowledge-based tests were delivered to the Science 10 class (the participating class) and the Science 9 class (the control group) within three time intervals; the pre-program in August/September, the post-program in November/ December, and the follow-up in February/March. Follow-up evaluations are not only useful for enhancing the reliability of data in case studies that are concerned with learning outcomes, but they have also proven to be an essential method for determining whether knowledge has been retained beyond the short-term limits of the intervention (e.g. Krasney and Lee 2002). For the purposes of my study, I chose to delimit learning outcomes within the scope of my research time-frame (from September 2004 to March 2005).

Knowledge-based test questions were designed to test students' knowledge about the environment, and were developed prior to the program in anticipation that the material would be included in the classroom lessons (provided by either the science teacher or myself) leading up to and including the ecological monitoring program. Thirty questions were initially developed from a variety of sources, addressing issues such as

water quality, water use, water chemistry, biodiversity, and aquatic invertebrate biology at both provincial and national scales (topic areas and full sources specific to each question are listed in Table B1 in Appendix B). Test questions were reviewed by the teacher to ensure that they reflected the appropriate level of difficulty for her class, were consistent with her own teaching objectives, as well as fulfilling Science 10 curriculum requirements set out by Saskatchewan Learning (2005b). Ultimately, 3 questions did not meet these criteria and were eliminated from the test, leaving a total of 27 remaining.

3.5.3 Photographic Diaries

The use of visual methods, such as participatory diagramming (e.g. Kesby 2000; Kesby *et al.* 2003), participatory video (e.g. Kindon 2003; Kindon and Latham 2002), and photographic interpretation (e.g. Young and Barrett 2001) is increasingly recognized in social research (particularly in ethnographic enquiry) as a way to explore how social life is constructed through social interaction and individual experience (Ball and Smith 2001; Pink 2001; Prosser 1998; Rose 2001; Silverman 2001), and also for their ability to engage participants of any age in the examination of how identities are created (Kindon and Latham 2002). In a similar vein, Schwartz and Ryan (2003) advocate the use of photographs in the deconstruction of place, exploring broader ideas about how the meanings and identities associated with landscapes, both built and natural, are negotiated.

There are claims that sense of place cannot be understood without first knowing its cognitive and emotional content (Stedman 2003), and that for young people, these interpretations are seen through a "cultural lens" that is unique to their age group (Leyshon 2002, 180). Thus, rather than solely assessing the program's impact on students based on the many existing definitions of place in geography (e.g. Johnston *et. al* 2000), environmental psychology (e.g. Stedman 2003), and sociology literature (Tuan 1977), I chose to examine sense of place in the context of students' own interpretations of what was important to them.

My own approach to the use of photographs in this research was modified from Kindon and Latham's (2002, 16) "Diary-Photo Diary-Interview" method. Photographic diaries have been used in previous research with children to unveil a comprehensive account of their daily lives (e.g. Tapsell *et al.* 2001; Young and Barrett 2001) by incorporating as much of their own narrative as possible into the research, complementing

and reinforcing data from written texts and interview conversations. For these reasons, the use of photographs to guide students' own interpretation of place also addresses contemporary concerns associated with lack of trustworthiness in, and inaccurate representation of, data (e.g. Prosser 1998). My use of photo-diaries as a way to facilitate student interviews was concerned with revealing their "embedded knowledge," enabling them to express the intimate associations, or entrenched meanings they hold for particular places – in other words, how young people *see* and *experience* their place (Hyerle 1996, 11). These are perceptions of place that arise from students' lived experiences, and which may have been difficult to access using more traditional qualitative research methods.

From the outset, students were informed of the purpose of my research, and my research questions more specifically, with the aim that this understanding would help them to become more involved participants in the research process. Prior to the ecological monitoring program, each student was provided with a digital camera and a log sheet and was requested to create a photo-diary of place. For this take-home assignment, they were instructed to take photographs (as many as they wished) of "things" (i.e. objects, environments, locations, or aspects of their environment) that were of importance or interest to them in and around their community, while making notes that specified what they had photographed and why (including a brief description of the photograph itself, from where it was taken, and what was meaningful about it) (see Appendix C for the activity instructions). This photo-log sheet was used to remind students about the photographs that they took and why, at the time of interviews. They were told that in addition to helping me understand what place means to them for research purposes, that their photographs would also be used to create a large mural or map of their local community and region, with the working title "my favourite places" - something that they would later share with their school and community.

Because my own understanding of place (as it related to the research) was concerned with those physical environments that exist outside of locations or settings where social interactions are traditionally carried out (e.g. institutional or informal, such as the school and the home respectively) (Agnew 1987 in Johnston *et al.* 2000), my initial delimitations for photographing place included aspects of the natural or built environment, which existed outside the home. This delimitation was established with the

intention of narrowing students' description of place to elements that I believed would be more relevant to my research questions and conceptions of the environment as an "outside" place. Rather, during this assignment, many students approached me with questions that suggested that aspects of their material or social worlds, often tied to the home, were too important to not include in their photo-diaries. As a result, I lifted this restriction, and hence my own bias in how I anticipated that students would define their place in the context of this research project. The only condition remaining was that students not take photographs of people for reasons of anonymity. In such cases where, despite this request, photos did expose individuals (other than the research participants themselves), these images were excluded from data analysis.

3.5.4 Interviews

One-on-one, semi-structured interviews were conducted with students within the same week photo-diaries were completed.[11] Students were asked to choose five of their most meaningful photographs. These photographs were displayed in full screen view on the laptop computer during interviews and were used to guide the discussion on how students defined their sense of place. In open-ended questions (encouraging as much as possible, the expression of students' own subjectivity in their responses), students were asked to describe their reasons for taking their selected photographs, to state what features of the pictures interested them, and anything else that may have been meaningful about the images (refer to Appendix D[i] for the interview schedule). In order to help address possibilities that logistical issues or time constraints may have been a factor in "missed" photographs and inaccurate representations of place, students were also given the opportunity to describe any "imaginary" or absent photographs that they may have liked to have captured, but may not have had the opportunity to complete over the course of the photo assignment. Student photographs were also a useful way to initiate

[11] I felt that timing between the completion of photo assignments, interviews, and the monitoring program was key to ensuring that photo-diaries and interviews revealed what they purported to evaluate. For example, making sure that interviews were conducted within 2 days of the completion of photo-diaries was essential to ensuring that students could recall the significance of photos. Similarly, post-program interviews were completed within 2 weeks of the field excursion (i.e. when monitoring activities were concentrated), so students' experiences could be easily recounted in interviews.

conversation, particularly for students who were more reserved in the interview setting. This procedure of completing the photo assignment and discussing pictures in interviews was also repeated immediately following the field excursion with the initial purpose to observe possible differences in students' interpretations of place both before and after the monitoring program. During the post-program interviews, students were also asked a second set of direct questions about how the monitoring program helped them to learn more about their local environment, how it affected the way they felt about their place, as well as how they would change the program in the future to help meet these objectives (see Appendix D[ii] for the entire student interview schedule). The latter question was posed to facilitate reflexivity within the ecological monitoring program so that curriculum materials could be modified if necessary, to enhance their effectiveness for the school's use in successive years.

Office space was made available at Eastend School for interviewing. Student interviews took place during class time, and lasted approximately 45 minutes for the pre-program, and 1 hour for the post-program (additional time was required for questions relating to the evaluation of the program, feedback, and general questions or discussion).

I also conducted interviews with other people whom I considered to be representative of this learning community, with the aim to bring additional perspectives to the research (see Figure 3.5 on page 42). These interviews were carried out shortly after key monitoring activities were completed. Interviews were conducted with teacher participants from both Eastend and Val Marie, the Eastend School principal, as well as a local FRBP representative (also a retired science teacher and school administrator). The purpose of these informal interviews was to provide further insight into how the program may have impacted students from the perspective of an educator, to obtain information on their own impressions of working within the context of the FRBP, and lastly, to consider how this partnership fit within their own definition of a learning community as well as descriptions drawn from the literature (refer to Appendix D[iii, iv, v, and vi] for interview schedules). All interviews were taped and transcribed for later analysis.

3.5.5 Participant Observation and Textual Data

Rooted in interpretive sociology, participant observation has been described as the "imaginative immersion of the observer in the experiential context of the subject" (Johnston *et al.* 1994, 270). This method attempts to uncover the lived experience of the research subjects by enabling the researcher's own subjectivity to enter the research process (Kruger and Shannon 2000). Unlike the extensive participant observation that is often characteristic of ethnographic studies where researchers spend prolonged periods of time in the field, the notes that I made during my fieldwork through direct observation of participants were informal and were used to augment my qualitative data with a series of anecdotes and personal reflections. These field notes were particularly useful to record interactions observed among students in the course of their monitoring activities.

Textual data were also gathered from work completed by students, contributing to a more holistic portrayal of their experiences. Students' final project reports and a selection of mid-term exam question responses were collected. These were used to supplement qualitative data; however, they were not subjected to an in-depth analysis. Photo-log sheets (used in photo-diaries) were also incorporated and thematically linked with the corresponding interview transcripts for later review.

3.6 Data Analysis

3.6.1 Quantitative data

The quantitative component of my assessment of students' environmental awareness was solely drawn from the knowledge-based tests. Students' answers from these tests were transferred to Scantron® optical grading sheets, so that several different analyses could be performed using Hewlett Packard's OpenVMS alpha software version 7.2-2, at the University of Saskatchewan, Information and Technology Services Office (2005). The mean scores and standard deviations were calculated for all tests. These measures were also applied to a subset of 13 questions (out of the 27 questions) that I deemed to be the most directly related to the monitoring program. Table 3.2 summarizes three additional analyses that were performed on the tests to obtain more detailed information on individual test item difficulty (differential), test item discrimination (point biserial correlation), and overall test reliability (Kuder-Richardson reliability). These

analytical measures were used to assess the internal reliability of the test questions themselves and the overall effectiveness of the test.

Table 3.2. Summary of additional test analyses used for knowledge-based tests.

Analysis Tool	Purpose	Formula
Differential (%)	Determines the difficulty of each test item by measuring how many students out of the group answered each question correctly.	(# of students who answered correct / total number of students) x 100 %
Point Biserial Correlation (r)	Measures the discriminating power of each test item by correlating the frequency of higher scoring students answering each item correctly, and the frequency of lower scoring students answering each item incorrectly.	$r = \frac{(\bar{X}_1 - \bar{X}_0)\sqrt{p(1-p)}}{S_X}$ Where: X_1= Mean total score for students answering correctly X_0= Mean total score for students answering incorrectly p = Proportion of students answering correctly S_X = Standard deviation for total test
Kuder-Richardson Reliability-20 (KR)	Measures the reliability or internal consistency of the test by examining the total number of questions on the test, the students' performance on every test item, and the whole-test variance.	$KR = \frac{N}{N-1} * \frac{V - \sum_{i=1}^{n} p_i q_i}{V}$ Where: N= Number of items in the test V= Variance of total test scores p_i= Proportion of students answering item *i* correctly q_i = Proportion of students answering item *i* incorrectly

(Sources: Brown 2001; Indiana University of Pennsylvania 2003).

3.6.2 Qualitative data

My interpretation of students' photographs and interview transcripts was modified from a phenomenological method of analysis as developed by Colaizzi (in Creswell 1998) – an approach that is directed towards revealing the meaning behind participants' experiences. This examination of students' photographs and accompanying narrative was a time-intensive and rigorous process, and also served as one of the central components of my data analysis, especially to the evaluation of students' sense of place.

The first phase of my data analysis involved selecting significant statements from the interview transcripts. This process was guided by my understanding of sense of place as it was presented in the literature, and in particular Stedman's (2003) two-dimensional classification of sense of place, as either related to place satisfaction (attitudes of like or dislike), or place attachment (identity). As shown in Table 3.3, significant statements that were made in reference to particular photographs were extracted from the interview transcripts and entered into a spreadsheet in Microsoft Excel to correspond with the relevant photographs. In the second phase, I analysed each of these photos individually, in conjunction with their corresponding statements. Students' own key words or phrases were identified and used to help me to interpret the meaning of these statements (see Table 3.3). For example, as illustrated in Table 3.3, students' interpretation of a photograph of the prairie landscape - described in their words as a place where they have "grown up," and which looked "like a painting" - I would classify as "familiarity" and "aesthetic value," respectively. In this critical step, Colaizzi (in Creswell 1998) underscores the importance of not breaking the linkages between meanings and the original statements, and in staying true to the meaning conveyed by interviewees. For this reason, I cross-referenced these interpreted meanings with students' original statements, and also reviewed my earlier interpretations again during the latter part of my analysis for internal consistency. Lastly, these meanings that were derived from students' photographic interpretations and expositions (many of which surfaced more than once) were categorically aggregated into comprehensive lists according to the themes that emerged. The culmination of this process represented my characterization of *place* for student participants.

Table 3.3. Sample of data analysis for student photographs and interviews (Refer to Appendix E for further examples).

PRE-PROGRAM						
Student ID	**Photograph #**	**Photo Subject**	**Theme(s)**	**Meaning(s)**	**Student's own words**	**Selection of Significant Statement(s)**
4a	**1** 	Prairie Landscape	Natural Environment, Land, other: Home	Familiarity, place identity, appreciation for prairie landscape, ability to see the landscape with a different perspective, aesthetic value, appreciation for country lifestyle, recognition of and appreciation for physical isolation, home, place attachment	1. Normal south of Saskatchewan, clouds look neat, home sweet home, prairie is place 2. Grown up, prairie, farm, my surroundings, nearest house five miles away 3. Think of Saskatchewan, think of the prairies 4. Like a painting 5. Before project people think prairie plain, see everyday, realize, different perspective, see as far as you can see	1. "I just really love that picture because it really shows Saskatchewan...It basically kind of shows the normal south of Saskatchewan – pretty flat. This was after a thunderstorm had passed by our house, and I thought that the clouds looked really neat. And it looked really nice…[sigh]. Saskatchewan, home sweet home...the prairie is Saskatchewan, and so to me the prairie is place." 2. "I don't know, it's just that basically I've grown up on the prairie, living on the farm so far from town, and basically this is my surroundings. The nearest house is just across the road, but then the closest one after that is at least five miles away." 3. "...when you think of Saskatchewan you kind of think of the prairies and how flat it is. And this basically shows how far you can go – like there's a big expanse of flat land." 4. "I kept looking at it because I thought it just looked exactly like a painting!" 5 "...in this picture it's kind of to show how the prairie is so flat. Actually even before this photo project, most people that actually live in Saskatchewan kind of think of it kind of plain because this is what they see every day, but then I took that picture and I realized that, I kind of got to see it from a different perspective, the way that people that come to it – come to Saskatchewan and have never been here – how they see it...most of the time they're from a place which has – you can't see as far, you can't see the whole land there, so it's kind of a treat for them to see as far as you can see...For us here it's just kind of plain, and we don't take the time to look at it because it is all around."

Prior to my fieldwork, I intended to describe the program's impact on sense of place by identifying shifts in how students define place, before and then after participation. My initial approach assumed that a) changes in the meanings that students conveyed would also reflect their shifting sense of place, and b) that these changes would clearly be observed. These assumptions were, in effect, overly simplistic – a finding that had implications for my results, and which I explore in Chapters 5 and 6 of this thesis.

All interview transcripts were coded using the qualitative analysis software, ATLAS.ti, which helped me to identify and categorize dominant themes that emerged from the interview data. The codes "environmental awareness," "sense of place," "experiential learning," and "participatory learning," helped me to organize broadly and retrieve all students' statements that reflected the areas that corresponded to my research questions. For example, the code "sense of place" was applied to any comments that portrayed sentiments of satisfaction with, or attachment to, their community or region. In addition, transcripts were coded for monitoring activities that students "liked" and "disliked." It is important to note that I did not code the section of student interview transcripts that dealt with photo-diaries. As mentioned above, these statements were analysed manually with their corresponding photographs and this information was entered into an Excel spreadsheet. I employed a two-stage approach in examining how a learning community may have shaped students' experiences. First, ATLAS.ti outputs for the code "participatory learning" summarized all responses to interview questions and comments relating to a learning community. Second, I identified the structure of the learning community by taking an inventory of all levels and modes of social interaction and communication among participants, and organized this information into a hierarchy of knowledge transfer. Finally, data derived through student and teacher interviews, field notes, photo diaries, and curricular materials were triangulated to provide comprehensive insight into how students' participation in the program contributed to their environmental awareness, and affected their sense of place, as well as how a learning community may have affected these outcomes.

Respondent validation, or member checking, is one way to enhance rigour in qualitative research and to ensure that research results reflect the intended meanings expressed by participants (e.g. Creswell 1998; Silverman 2001; Stewart 1998). In March, 2005, I returned to Eastend School to present preliminary findings to the Science 10 class and to obtain feedback (particularly with respect to key

interpretations of sense of place based on their interviews and photo-diaries) before writing this thesis.

Plate 1: Students from Eastend School participate in ecological monitoring of the Frenchman River at a site near the town of Eastend.

Plate 2: Students from Val Marie School engage in monitoring activities in class and in the field.

CHAPTER 4: DEVELOPING A LEARNING COMMUNITY TO ACQUIRE ENVIRONMENTAL KNOWLEDGE

4.1 Introduction

In this chapter I describe the contributions of a learning community to facilitating knowledge acquisition within the Grade 10 science class in Eastend. I also consider what is meant by participation within this ecological monitoring project based on some of the challenges and successes encountered in both the communities of Val Marie and Eastend. Although the focus of my data collection was in Eastend, the Val Marie experience provides a useful frame of reference by which to compare the overall impressions of the ecological monitoring program from the perspective of students, teachers, and community members.[12] In Section 4.2, I begin by introducing the socio-political setting in which the program took place in both communities, and then in Section 4.3 I shift my focus to evaluating the program's impact on students in Eastend, providing both a quantitative and qualitative assessment of their learning outcomes using the results of knowledge-based tests and interviews. Whereas knowledge-based tests cast a glimpse at students' learning outcomes from a quantitative perspective, qualitative data derived from interviews provided a more in-depth portrayal of students' experiences, as communicated through the words of the participants themselves. Finally, in Section 4.4, I present an overview of the numerous hierarchies of learning through which information was shared, and reveal some of ways in which this community of learners provided agency for these educational outcomes, both procedurally and symbolically.

[12] Although the examination of multiple cases increases generalizability in social research, I recognize that this holds less weight in qualitative inquiry. For the purpose of this thesis, I wanted to strike a balance between providing an explanation of the in-depth meaning of students' experiences and the overall experience of each school's participation in the program. Although I would argue (through observation alone), that students' environmental learning outcomes were very similar in both schools, each case presented an entirely different experience with respect to their relationship with the FRBP. If I neglected to address these differences in the context of limits to, and bases for participation within a learning community, I would risk misrepresenting the full variation of experiences that occurred in both communities.

4.2 Participation within a Learning Community

4.2.1 Setting the Context

The development of the ecological monitoring program in the schools of Eastend and Val Marie was guided by differences in elements of the administration, educational priorities, and in the socio-political climate of the respective communities at the time. Throughout the duration of my fieldwork, Eastend School was under the leadership of a relatively new administrative body. The recent tenure of the Director of Education for the Eastend School Division, and the hiring of a new principal for Eastend School in September 2003 resulted in a favourable atmosphere in which to set up the monitoring program and my Master's research project. My project met significant enthusiasm and a willingness to collaborate from both levels of administration. The principal at Eastend School brought his experience in building community-school initiatives in Northern Saskatchewan to his work in the town of Eastend and envisaged schools as "public facilit[ies]," commenting that "[schools] should have a relationship with the public that [they] serve." The principal further held the view that "[students] need to learn things that are immediately around them, that surround them," drawing the example that "the more regional and provincial, and federal…or international and global concepts don't have any context unless [students] get to know what their little community has to offer and what it consists of."

In alignment with these educational ideals (and at the time of my fieldwork), the Eastend School Division was piloting a program called the "SchoolPLUS and the Effective Framework," with the mandate "to engage the community in the development of the larger learning community" through six areas of effective practice, two of which included "authentic partnerships" and "responsive curriculum" (Eastend School Division 2004).[13] In support of project-based learning as a means to

[13] The Eastend School Division is one out of 18 divisions piloting the SchoolPLUS program in the Province of Saskatchewan. At Eastend School, this reflexive, 3 year action research project involves community mapping through surveys and workshops. As part of the SchoolPLUS initiative, Eastend School's goals also include two principle educational objectives: the first, "authentic partnerships" seeks to "develop opportunities to engage the community use of school facilities, resources, and events at the school", and with the aim to "[build] partnerships and opportunities to utilize skills and resources of the community to enhance learning opportunities for students"; and the second, "responsive curriculum," includes "seek[ing] ways of enhancing and exploring personal development and career knowledge and opportunities for students" and "opportunities to enhance parental knowledge and involvement in assessment of curricular activities" (Eastend School, no date available).

achieve these ends, Eastend School's recent efforts to foster partnerships through the "SchoolPLUS" initiative presented an administratively and educationally conducive context for the ecological monitoring program. In 2003/2004, the school conducted focus groups and surveys in order to identify partners both within and outside the local community (including parents), to generate ideas on how school facilities could be used most effectively to create learning opportunities, and to determine ways of establishing greater community involvement in school curricula (such as drawing on local expertise in educating students).[14] Some of the key goals outlined included building partnerships with post-secondary institutions and increasing the use of technology in schools to effectively "bring the world to students" as a way to provide educational opportunities and experiences that were more consistent with those encountered in larger, urban schools. The principal saw this Master's project and the related monitoring activities as a way of "actualizing the plan," having never had the opportunity for his school to be involved in a project that, in his words, was as "experiential and in-depth." In a region where distance between communities and rural municipalities is an obstacle for social interaction and networking, the immediate proximity of the Eastend School Division office to the School in Eastend further enhanced accessibility, helping to open corridors of communication between the central office, the school, and myself throughout the program.[15]

In Eastend, a collaborative approach to education was realized early on in the development of the ecological monitoring program and maintained throughout its implementation. As discussed in Section 3.3, the science teacher in Eastend provided substantive input into the format of monitoring activities at regular informal meetings (particularly throughout the summer prior to the program), addressing issues of timing, duration, sampling location, and curriculum content that met her own educational objectives, and which were context-appropriate. The length of the project in Eastend, which extended over an entire semester (from September to December), included significant time spent on water chemistry analysis and the identification of invertebrates for the FRBP (as shown in Table 3.1) contrasting significantly from the

[14] Eastend School has a recent history of working with the local organizations, such as the Wallace Stegner House (in affiliation with the Eastend Art's Council) and with the T-Rex Discovery Centre in Eastend on various educational programs and workshops.

[15] Interestingly, the amalgamation of school divisions in January 2006 resulted in the closure of the Eastend office, which will invariably alter the nature of ongoing program initiatives and partners' relationships with the school's upper level administration.

abridged version that took place at Val Marie School. Here, fewer hours of class time were spent on project activities beyond the one-day field excursion and involvement in program development was minimal.

Educators at Eastend School were eager to participate in my Master's research project and were interested in being affiliated with the FRBP. By contrast, in Val Marie, the socio-political climate and concerns surrounding the FRBP and environmental research more generally, became more central to my experiences there. Since the official proclamation of Grasslands National Park in 2001, there has been an influx of interest and biological research in the area. Accompanying this attention, many local residents have had negative experiences with other researchers collecting samples from private property without requesting prior permission to grant them with access. This distrust of outside researchers has been coupled with a disparity between how ranchers view themselves and how they feel that they are perceived by government agencies, conservation organizations and others in managing their natural resources (Bell and Reed 2003). Local residents consider themselves stewards of the land and the most effective conservationists for their role in preserving the large, intact areas of native mixed-grass prairie.

It is also noteworthy to consider that in both Val Marie and Eastend, where livelihood is intimately connected to the land, "timing is everything" (participant 13). In September 2004, these communities were reeling from the economic impacts of BSE,[16] as well as an early frost and heavy precipitation (which destroyed many crops in Southwest Saskatchewan, and delayed the fall harvest) – events that contributed to a climate of apprehension over the viability of the industry, and hence their livelihood. Resulting from the above-mentioned differences in ideology and an already precarious economy, residents raised concerns over how the FRBP would use the ecological data, and who would be privy to that information. Furthermore, fear of government legislation designed to protect species-at-risk exacerbated these concerns

[16] Bovine Spongiform Encephalopathy (BSE), commonly referred to as "Mad Cow Disease," is a progressive, fatal disease that affects the nervous system of cattle, and which is possibly transmissible to humans through consumption of infected meat (Canadian Food Inspection Agency 2005). In May of 2003, one case of BSE was confirmed in a Canadian cow (and two more cases, later in January of 2005). The outfall of these findings, or what has been termed "the BSE crisis," affected international trade, and included US border closings to live Canadian cattle between May 2003 and July 2005, plummeting market values for livestock, and thereby devastating producers and the industry at large (CBC 2006a). Some estimates place losses to the livestock industry across the country at over 7 billion dollars (CBC 2006b).

over the potential impact of the FRBP's findings. These reservations extended further to include the results of students' samples if ecological data were to be included as part of the larger biodiversity study. Interestingly, the actual risk of data being accessed by government officials was less likely to be a result of direct affiliation with the FRBP, but was rather connected to protocols established by Saskatchewan Environment (SE). In order to collect water samples from the Frenchman River, a "Special Collection Permit" had to be obtained from the Ministry. The acquisition of this permit presented a particular set of challenges – both in principle and practice. In addition to being required to contact the local conservation officer at the Shaunavon field office prior to any field activities, this permit would only be granted on the condition that we (the schools and myself) provide SE with a final report, including a summary table of data collected and locations from where samples were taken. Because there is little information gathered on the biological diversity and water quality of the Frenchman River, any monitoring that is carried out in the region is considered valuable to the government (Murphy 2005). The Crown also makes this information available to the public and other researchers. Again, fears were born from possible repercussions if certain species or water quality conditions were to have been found on, or near private property. There was also an added concern over potential inaccuracies in data collected by students. Logistically, fulfilling these government requirements would be time consuming and onerous for teachers, with the potential to dissuade them from future monitoring. Additionally, the condition of providing a summary of results to the Ministry defeated the rationale behind community-based monitoring - to keep ecological information in local communities and under local control (such as through the schools' maintenance of a local database of ecological information about the Frenchman River). In the end, the permit was granted, but despite the interests of SE, I made an agreement with private landowners to exclude all information (including the location co-ordinates relating to their property), from the final report.[17]

[17] It is also worth noting that by June 2005 (following my fieldwork and in the schools second year of monitoring), arrangements were made with SE that would allow for greater flexibility in the acquisition of the permit and the information included in this final report. For example, this compromise included allowing a stewardship group to apply for a "blanket" permit on behalf of schools, and providing them with the permission to report on data collection activities and samples taken, while excluding the data gathered on the basis that monitoring would be for educational purposes only (Murphy 2005).

As illustrated in a comment made by one individual who stated, "we are park people within a ranching community," local residents describe Val Marie as a community divided. A participant in Val Marie articulated how this local division between groups and the politics surrounding the school's potential relationship with FRBP impacted her as a teacher, stating "… through coffee row, and through small towns…it gets back to you, and again, once I heard two or three [comments], I just thought you know I don't want to even be part of this boat - they can rock it themselves." This fear among members of the community – which an interviewee attributed to "fear of bad experiences, fear of the unknown, fear that they don't know everything" (participant 13) – precipitated the science teacher's decision not to participate with her class as part of the larger biodiversity study in Val Marie (and instead to carry out ecological monitoring independently with my help in its facilitation). These tensions were further exacerbated by the overlapping roles, or multiple positioning of members within this small community. In Val Marie, the local FRBP steering committee representative (who, in this role, on one occasion had come to the school to introduce the science class to the FRBP), was not only a local rancher and an employee of GNP, but also served as member of the Shaunavon School Board. In this way, issues surrounding relations of power and authority added to the complexity of program arrangements and decision-making, creating the potential for conflicts of interest and coercion (even though this power was not exercised in the end).[18]

Despite the shared background of Eastend and Val Marie as ranching communities, each community, historically, has taken largely different stands towards local environmental politics. The substantive contrast in the response of each school to the ecological monitoring program and their relationship with the FRBP also reflected these differences. The principal at Eastend School shared his position in reference to similar cases of local controversy, stating "my job is to educate, not to judge or evaluate,"[19] whereas by comparison, the teacher participant in Val Marie

[18] My use of the term "power" is in reference to agency, or the ability to achieve outcomes. "Power relations," therefore, describe relationships between individuals and groups that can affect the capacity for target objectives to be reached, such as objectives for collaboration and data sharing within the context of an ecological monitoring project.

[19] With the propensity towards educational prioritization over political influence, Eastend School took students to the Old Man On His Back Prairie and Heritage Conservation Area in 2003, both to be present for a ceremony where contributors of the land were acknowledged, and again for the bison release at the end of that…

expressed concerns that being affiliated with the FRBP would create "some kind of political problem in the community," reasoning in her words, that "I wanted to keep the school out of that…I wanted this to be a really positive learning experience for students…I just wanted to keep [the program] educational, focussed on the kids, and let the politics be out there if they so choose." The School Principal in Val Marie (who was relatively new to the community) was strongly in support of the ecological monitoring project and collaborating with the FRBP; however, he (along with other members of the school's administration) elected not to intervene and take an authoritative stand on this position.

4.2.2 Identifying Meaningful Participation

As identified in Section 4.2.1, specific barriers to participation included bureaucracy surrounding the sharing of knowledge, and issues of power, authority and access to information, concerned with the lack of control over water quality and biodiversity information. My use of the term "participation" corresponds with definition in the Canadian Oxford Dictionary (Barber 1998, 1060), "to share or take part in." To elaborate on this meaning, Wenger (1999, 55, 56) refers to participation as "a process of taking part, and also to the relations with others that reflect this process," underscoring that participation is not tantamount to collaboration, and more specifically, I would argue that it represents a continuum of potential involvement, as reflected in the cases of Val Marie and Eastend. My experiences in both communities suggest that there are differing levels of participation that existed within the learning community. Whereas Eastend School's relationship with the FRBP was characterized by open lines of communication (through local steering committee members, and myself as a program facilitator,) as well as a willingness to share ecological data, the Val Marie experience demonstrates that there were limits to participation, which had to be recognized and accommodated in order for ecological monitoring to occur.

Not only did criteria for *full* participation in the context of this project include basic elements, such as the building of trust, communication, accessibility of parties,

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year. This 5,300-hectare range (previously privately owned ranch land), located in the Cypress Uplands (Sask Power 2005), was a source of significant local opposition that resulted from a controversial partnership between Nature Conservancy of Canada and SaskPower to protect native grassland in Southwest Saskatchewan. Local discontent related to the Crown's use of public funds to purchase land for conservation purposes, which would also prevent neighbouring residents from accessing what they viewed to be a valuable agricultural resource.

and the sharing of information, they also related to the more intangible boundaries that existed within this learning community. In Val Marie, these boundaries were created through perceived fears as to how ecological data would be used, stored, and accessed. Boundaries were further confounded by the current nature of insider-outsider relationships, which were also characterized by lines of division between who local residents have referred to as the "old fundamental farmers and ranchers" and the "environmental park community"(participant 12). Within this context, the limits to participation were related to demarcations, as an outsider to, or insider within the community, whether pointing to one's place of origin or simply a status attributed to one's political views and conservation ideals. Each position required the building of trust within this relationship (a theme outlined by social scientists as paramount to successful CBEM, e.g. Berkes 2004; Shindler and Cheek 1999) – a rapport that was compromised early on, prior to the FRBP's entrance on this political stage. Several factors over which the FRBP had no control included the recent history of tensions between local ranchers and park officials regarding land use strategies and management (such as wildfire, pest control, and grazing patterns within the park boundaries), negative experiences with previous biological research in the area, and the perceived futility and fear associated with punitive approaches adopted by government ministries (such as by Environment Canada's Department of Fisheries and Oceans) and enacted through legislation such as the Species-at-Risk Act (with the presumed potential to be enforced if sensitive ecological data were to be released). These conditions set the FRBP off to a difficult start, and ultimately shaped the nature of participation in the ecological monitoring program in Val Marie.

Wenger (2004, 6), in his work on communities of practice, suggests that these insider-outsider relationships comprise a more "complex social landscape," in which the boundaries and peripheries continuously "open and close various forms of participation." In Val Marie, the nature of this participation required compromise on the part of the students, the teacher participant, the principal, FRBP steering committee members, and myself (as a program facilitator), as well as others in the community. The science teacher was willing to participate with her class in the field trip, as well as in all other activities related to the monitoring program; however, any affiliation with the FRBP - such as the sharing of ecological data, participating in community meetings, or being associated with the project in newsletters - was not realized, as Val Marie School elected not to take part. Furthermore, issues of membership within this learning community "opened" and "closed" doors to

participation. Expanding the learning community to include one group excluded participation of the other. For example, allowing science students in Val Marie to collect water samples from parents' private property (who in one case were also operators of a feedlot along the Frenchman River), fuelled concerns about the school being involved in a more formal biodiversity study. In other words, the decision to include parents more directly in the monitoring program contributed to the exclusion of the FRBP. Similarly, the participating teacher in Eastend also conveyed concerns that involving her science class in the FRBP, or what she described as "joining with those outsiders to look at the river when the community wasn't supportive of that," would put her in a position of being, in her words, "like a traitor to the community." In light of these looming concerns, local community members who were part of the FRBP steering committee, and in essence the local champions of the project, served an important symbolic function for the teacher in Eastend. As she articulated in the following statement, "their support has helped me in going through this whole process because I am aware of the concerns surrounding the river so I didn't feel like I was out on an island doing this all by myself. I knew I had their support and that meant a lot." In conclusion, regardless of preconceived ideas as to what would constitute participation and how that involvement would be realized in the context of the different, and sometimes conflicting, individual agendas of members of this learning community, the flexibility of all participants and the unconditional support from key members were critical to enabling the program to take place in both Val Marie and Eastend.

However, despite the important symbolic role of this partnership in Eastend, most interaction and communication between students and members of the FRBP was facilitated through myself, with little dialogue between the two parties. As a result, formal communication between the FRBP and the schools was limited, as expressed by the teacher participant in Eastend: "The only thing that made [students] aware of the FRBP, other than you mentioning it, was a [FRBP member's] little presentation to them and then the newsletter…but other than that, we have heard nothing from them. So, I don't think there has been much connection there" (teacher participant EE). This distance was also felt by students, who, in recognizing the role that they were playing in the FRBP, also felt that there was a space that could have opened to greater involvement:

> *Researcher:* Do you feel part of the community by participating in this project?
> *Student participant EE:* I am sure the school does [feel part of this project]. I probably do too somewhere deep inside of me… Just the fact that the project is school-based, like one would go out of school, we are not devoted as some people are, like [our local FRBP representative and teacher], like he does this probably every day. It's just in school that we are part of it. It's probably, inside we are [part of it], but to get more people involved then we'd have to go out there when they [the biologists] are working on it too...(student participant 2b).
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It is also important to mention that initial intentions (early in the planning phase) were to bring together students and teachers from Eastend and Val Marie to work jointly to collect and exchange ecological data, and share information. Yet, factors such as geographic distance, logistics, and teacher interest inhibited any interaction between the two schools.

This disconnect between students and the larger biodiversity study, as well as between communities, raised important questions as to what constitutes meaningful participation, or (in the language of participants in Eastend) an "authentic partnership" within a learning community even when parties are willing to work together towards a common goal.[20] Questions of a similar vein have arisen from sustainability research, addressing issues as to how opportunities for citizen engagement in planning and stewardship projects may be enhanced in a way that is more meaningful to local people (e.g. Kruger and Shannon 2000; Matthews and Limb 1999; Moote *et al.* 2001). Although my intent in this thesis is not to explore the many ways in which collaborative partnerships and civic participation can be better achieved in CBEM or stewardship projects, my own experience with both schools underscores the potential value of identifying, and then drawing from resources that are available within the local communities as well as within the network of project participants more generally. In both Val Marie and Eastend, these linkages would have also helped to broaden the level of local involvement and the significance of

[20] Because the FRBP is a multi-year initiative, the nature of their involvement in local communities and schools is continuously evolving. The observations that I have presented in this thesis are based on fieldwork carried out within the 2004 -2005 school year, and since that time, new participants have joined the steering committee, while others have left, influencing the nature of the relationship. The FRBP now has a local co-ordinator, and efforts have been made by the project's biologist to provide schools with further tools to aid in students' identification of aquatic invertebrates.

partners' contributions to the project. Despite the availability of resources (in the form of equipment, educational resources, and biological expertise) accessible through the Park's office in Val Marie, few of these assets were utilized for the monitoring program in Val Marie, in part because of the political situation surrounding any affiliation with the park.[21] Interestingly, had greater involvement been sought from local experts at the GNP office in the Val Marie program, or similarly, a willingness among FRBP biologists to work alongside students in Eastend School during their monitoring activities, challenges that were associated with invertebrate identification may have been minimized, and concerns over accuracy of data may have also been reduced.

In light of Val Marie School's "partial" form of participation within the learning community, it is also important to consider how the school's involvement may have shaped students' learning outcomes and the meanings of their experience. One parent of a student participant in Val Marie expressed concern that the perceptive student would have observed the apparent tensions between different parties and their program objectives, and that these differences may have contributed to what she termed, a "negative learning experience." The idea that within a learning community "learning constitutes trajectories of participation" that ultimately "build personal histories in relation to the histories of [their] communities," sheds light on the possibility that meanings derived from participating in this monitoring program may have included a recognition of the intersecting, and often complex nature of conservation efforts and land use specific to the local community (Wenger 2004, 10). The polarized landscape of Southwest Saskatchewan could be seen, not only as highly aesthetic and biologically unique, but also as being socially diverse and politically charged. I would suggest that this type of learning from the perspective of students (and others) would not have necessarily detracted from the experience, but rather may have added another socio-political dimension to the range of environmental learning outcomes. Although the program in Val Marie did not adhere to the initial planning trajectory, Wenger (2004, 9) offers the perspective that learning communities are concerned with content – "about learning as a living experience of negotiating meaning – not about form." In both Val Marie and Eastend, participation was a vehicle for learning regardless of the specific nature of involvement. In the process of

[21] Resources available at the GNP office range from GPS devices, chest waders, local and regional maps, as well as biodiversity information pamphlets and videos, to insect and plant specimens found in the area.

learning about the local river, participants learned about each other – how to overcome barriers and to establish limits. In this way, participatory learning had both environmental and social components, wherein enquiry into the former required sensitivity to the latter.[22]

4.3 Students' Understanding of their Local Environment

4.3.1 Knowledge-Based Tests

In Section 4.2, I describe the social context for environmental learning. I now turn my focus from some of the social dimensions of knowledge acquisition, to individual student learning outcomes. This involves placing less emphasis on learning as a social enterprise, but rather exploring learning on an individual basis.

Knowledge-based tests were used in my research in an attempt to assess specific information that students gained about the environment. As illustrated in Figure 4.0, there was a minimal increase observed in mean test scores for pre-program, post-program, and follow-up tests in both the Science 10 class (the participating class) and the Science 9 class (the control group). The mean scores for the Science 10 class were 13.1, 15.1, and 17.0 for the pre-, post-, and follow-up tests respectively, and 10.9, 12.9, and 14.5 for the control group. However, irrespective of a consistent improvement in both groups, the standard deviation of the mean for test scores (which were calculated for each group) shows that there was not a statistically significant change across all three tests.[23] The small number of participants in each science class (10 students in each group) would have contributed to this lack of

[22] The importance of this social sensitivity was also underscored by the FRBP in carrying out their monitoring activities in the summer of 2005. Water samples they collected from various sites along the Frenchman River showed dangerously high levels of *Escherichia coli* (*E. coli*) bacteria. In meeting objectives for monitoring water quality, there was concern over how to address and communicate these findings to local communities (particularly when acceptance of the FRBP was already in a precarious position). The risks included inciting fear among local people, dissuading future community participation. How information was managed and shared could also directly affect the progress already made toward including students in data collection activities. Practical questions that remain include how to address environmental and human risk perception, how to make sure learning is safe, and how can conceptions of the river as a "play area" be cultivated when potentially harmful ecological conditions are uncovered.

[23] Because the initial measures of variance (expressed as standard deviations of the mean) were very large, I elected not to conduct a more detailed analysis of variance (ANOVA). The statistical power of my data was low because of the small sample sizes, and the high variability of scores.

statistical significance. Because there was only a small change across tests, a larger sample size would have been required to have sufficient statistical power to detect a difference of this magnitude with reasonable confidence (Cohen 1988).

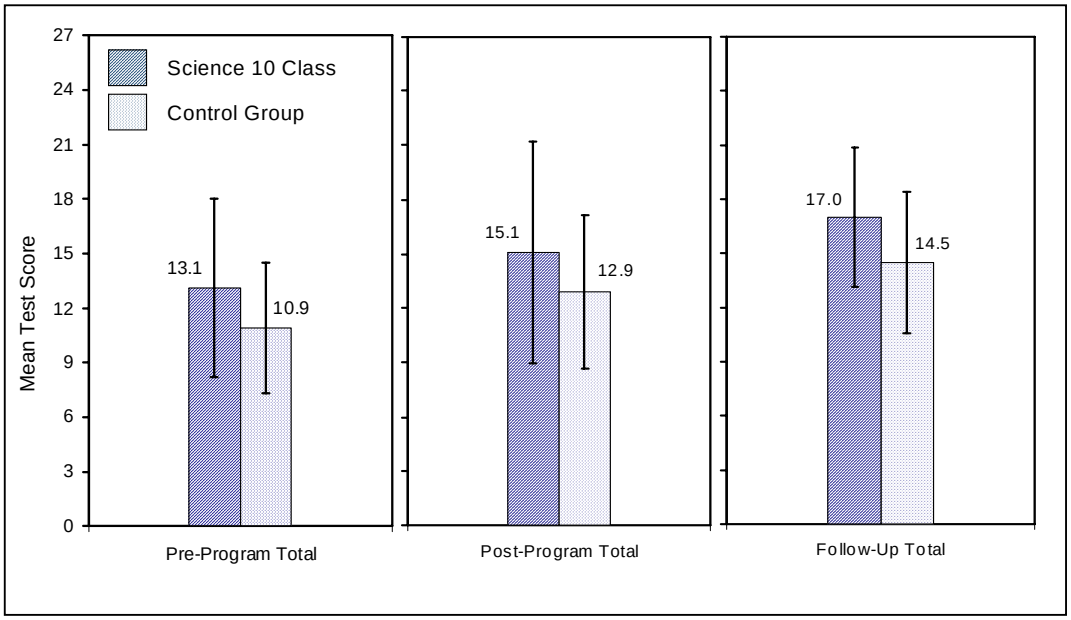

Figure 4.0: Mean scores for pre-program, post-program, and follow-up knowledge-based tests completed by the science 10 class (*n*=10) and the science 9 control group (*n*=10).

As demonstrated by the mean percentages that are shown in Table 4.0, overall test scores are also low in both the Science 10 class and the control group. There are several issues related to the internal validity of the test - how well the test measures what it purports to measure - that are of relevance here. In the context of this research, validity is concerned with the ability for the test to reflect the knowledge that students gained through their participation in the program. Because the test was developed prior to the implementation of the monitoring program in anticipation of the subject matter that would form the basis of program content, in effect, test questions were not an accurate representation of the applied skills or exercises that constituted the actual program activities (refer to the knowledge-based test, located in Appendix B). Furthermore, due to the iterative and collaborative nature of the program's development, with an emphasis on local ecology and understanding, many questions that were originally designed to test general environmental knowledge (such as factual information about the environment at the regional, national, and even global scales)

became unrelated to, and effectively detached from, the local focus of program activities. However, when the results of the tests are analysed for those 13 out of the 27 questions that most directly relate to the program content (expressed as "DR questions" in Table 4.0.), students show a greater improvement between pre- and post-tests (15%), as compared to the pre- and post-tests in their entirety (7.4%).

Table 4.0. Mean test scores and standard deviation of the mean for all complete tests (out of 27), as well as mean scores for only those questions (out of 13) directly related to the program (DR questions), displayed as percentages.

		Pre-Program Test Mean Score (%)	Post-Program Test Mean Score (%)	Follow-Up Test Mean Score (%)
Science 10 Class	Complete test (/27)	49 $^{+}$/- 18	54 $^{+}$/- 22	66 $^{+}$/- 14
	DR Questions (/13)	50 $^{+}$/- 22	65 $^{+}$/- 25	75 $^{+}$/- 21
Control Group	Complete test (/27)	40 $^{+}$/- 13	47 $^{+}$/- 16	54 $^{+}$/- 14
	DR Questions (/13)	44 $^{+}$/- 22	55 $^{+}$/- 27	65 $^{+}$/- 23

Not only do these results suggest that learning may not have been adequately captured in the tests, but also that any learning that did occur was not temporally fixed within the bounds of the monitoring program. Table 4.0 illustrates that students' mean scores continued to improve from 54% in the post-test to 66% for the follow-up test. Thus, irrespective of learning that may have occurred in both groups from the test itself (e.g. Charles 1998), it is evident that learning may have occurred beyond time frame of the program, as reflected in these test scores. During this period, the teacher incorporated further discussion and activities related to the program into the science classroom, including a mid-term exam. In this way, learning from the program was not bounded - as were the implementation of the knowledge-based tests themselves - but was rather a multidimensional learning process, involving action and critical reflection within a complex experiential and social context (see Wenger 1999) - a topic that I explore further in Chapters 5 and 6.

Although the Science 10 class scored consistently higher than the control group, it is noteworthy that the latter group also shows a constant improvement across

all three tests (as shown in Figure 4.0.).[24] When identifying and selecting the control group, I did not anticipate how exposure to the ecological monitoring project would extend beyond the science 10 class itself, lending to an impact upon other students or classes at Eastend School. Activities such as the FRBP logo design contest, for which the Science 9 class served as participants, and the student poster that was on display in the school and community generated interest among students and facilitated awareness about the program within and around the school.

In light of the above discussion relating to the validity of the knowledge-based tests, measures of individual test item discrimination (point biserial correlation), individual test item difficulty (differential), and overall test reliability (KR-20) were calculated and are shown in Table 4.1. The mean biserial correlations for each test were in the desirable range (0.333 – 0.513) although there were some questions on each test that showed a zero or negative value (see Appendix F for complete analyses of test questions). No single test item stood out as being sufficiently incorrect or "poor" to eliminate (i.e. having a point biserial correlation of zero or less across all three tests). Subsequently, in Table 4.1, I have provided the mean of the point biserial correlation for all test items in order to provide an overview of the quality of the test, with respect to its ability to discriminate between students. Note that a negative biserial correlation suggests that the question may have either been poorly constructed or misleading for the students (University of Saskatchewan ITS 2005; Tulane University School of Medicine 2001). The mean differential, or average percentage of students that answered each individual test question correctly is also shown in Table 4.1, and varies from 48.5 in the pre-test to 63.0 in the follow-up test for the science 10 class, and from 40.4 to 53.7 in the control group. The KR-20, or internal consistency of all tests is shown in Table 4.1, and is above 0.70 in every case, a level of reliability which is widely considered to be acceptable for a multiple choice test (Duvall 2005; Tulane University School of Medicine 2001; University of Saskatchewan ITS 2005). These values suggest that the test was of a moderate, but not unreasonable level of difficulty (Duvall 2005), again highlighting that validity was probably a more significant factor contributing to the modest improvements in test scores than test item difficulty.

[24] It is also important to note that differences in the educational background between the grade 9 and 10 classes may have also contributed to differences in base scores.

Table 4.1. Measures of test item discrimination, test item difficulty, and internal reliability for the pre-program, post-program, and follow-up tests in the science 10 class and the control group.

		Pre-Program Test	Post-Program Test	Follow-up Test
Science 10 Class	Mean Biserial Correlation (*r*)	0.370	0.537	0.513
	Mean Differential (%)	48.5	50.4	63.0
	KR-20	0.761	0.891	0.885
Control Group	Mean Biserial Correlation (*r*)	0.358	0.376	0.333
	Mean Differential (%)	40.4	47.7	53.7
	KR-20	0.739	0.780	0.702

4.3.2 Environmental Learning Outcomes

> "I learned a lot about the invertebrates and stuff, like all the animals and creatures that lived in there, and about the turbidity and a whole bunch of new tests, I learned how to do them." (student participant 4b)

To present an alternate, and more in-depth view of students' learning outcomes than knowledge-based tests, I conducted interviews with student participants. These interviews suggested that through participation in program activities, students acquired an enhanced awareness of their environment, grounded in local understanding about the river and learned applied skills for monitoring aquatic ecosystem health. Among these learning outcomes, students exhibited knowledge of water quality and biodiversity, as well as insight into the interrelatedness of ecosystem components, and the local variations that exist among sites along the river.

The Frenchman River forms students' "backyard," as a vital component of the physical and cultural landscape in Southwestern Saskatchewan. The river flows directly through the town of Eastend, it creates the backdrop of the local school grounds, and it is also important to the local ranching and farming community, including the families of most student participants. Thus, for students, the local river is "always there" as a ubiquitous part of their daily lives. And yet, while the river is familiar to them, it also represents a taken-for-granted aspect of their immediate surroundings. As demonstrated in students' comments below, the program provided

opportunities for extending students' existing perceptions of the local river to include a more comprehensive and in-depth understanding of its function and significance**.**

> I always kind of thought, "mmm it's just water." Water is water. (student participant 7b)
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>
> I didn't know all that was in our water. I was like "it's just water"…[The program] told me what nasty stuff is in our river…those scuds and stuff like that. The pH and stuff like that, that's in our water…I knew it had crayfish and those other type of fish. I knew it had something in there – I didn't know what. (student participant 10b)
>
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Participants demonstrated environmental learning in the areas of water quality, aquatic biodiversity, as well as ecosystem function and interrelatedness. Of most significant interest to students was the number of living things that they were able to see and identify in the water.

> I learned a lot from [the water chemistry tests] too, finding out what kind of water we had and if it's good for the environment…I didn't know anything about dissolved oxygen or anything. I didn't even know what that was. And *E. coli* – it was good to find out that we didn't have any *E. coli* in our water [laugh]. (student participant 6b)
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> …it made me think a little bit more about the river...because I didn't know there was so much life in there. Now I know. (student participant 1b)
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> I learned that there was way more animals in there than I thought. But I kind of figured that stuff like that was in there, it's just that I never actually took the time to look. I saw scuds and stuff that were bigger, but those little clam shrimp – I didn't know they were in there. (student participant 5b)
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> It made me go "okay, I kind of thought it was a bit desolate around here, obviously it isn't". I mean coyotes, deer and rabbits are about all you see around here usually, and the odd moose or elk and stuff like that, but you didn't really realize that all this stuff is in here. (student participant 5b)
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> I've never really known anything about dissolved oxygen. I've never thought that that's how the fish would breathe. I never thought about how fish breathe under water. I just figured they find their ways…I learned that the amount of dissolved oxygen in the water and the amount of, say nitrate or phosphate and stuff, affects what lives there and affects what can grow there. (student participant 4b)

Students also gained an understanding of the local variation that exists between sites along the river, and factors that contribute to these differences.

> What I learned the most was when we went to the site…Actually, I learned some neat things about the different sites, the different environments, how it could affect the water. I found out that turbulence affects the amount of dissolved oxygen and I learned that it could also be other stuff that could actually affect it and the pH. We had a lot of dissolved oxygen in that one place at the rapids. (student participant 4b)
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> I was surprised that larvae could swim that fast…Well actually, before I never really thought about it, it was basically just there, so I learned about different organisms that are living here that I didn't know about before and how different places can differ so much even though they are close to each other. (student participant 4b)
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> It was really neat how all the sites were really similar in like distance, [however] they were different because of all the environment that surrounded the sample site. At the ball diamond there was like the trees and stuff, and then you go out to [Johnson's] and then there is like nothing, it was bare. (student participant 2b)
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Program activities, such as going into the river to collect aquatic invertebrates as well as identifying them under microscopes, provided students with the opportunity to experience the river at different scales of inquiry: across sites, between sites, and within sites (i.e. at the watershed level, at the scale of individual sample sites, and through microscope examination of water samples respectively). Students recalled how seeing the water "up-close" influenced their perceptions of the river and their understanding of it more broadly.

> Well, like we swim in that water all the time and you never realize what kind of gross stuff is in it, and then we got to see all the little microscopic things that crawl around in there. You think "I swim in that and that water gets in my mouth when I swim in it," and it's just kind of gross. (student participant 3b)
>
> ~

The program enabled students to build on their personal history with the river (i.e. pre-existing knowledge acquired informally through life experience) and to

integrate new experiences into their existing knowledge. Much was unknown about the river from the perspective of environmental understanding, and thus the program also helped students to view their place through a different lens of enquiry and a more intimate form of engagement – where they were active observers of their surroundings, directly interacting with the river in the context of a formal school-based program, but within a non-formal educational setting.[25]

> Oh, well this town, I am not going to lie, it's small and I've been down there before so I know what to expect, but [the program] just kind of gave me more of a view than just "oh yeah, there's the river down there," instead of going "well, we've been around the river, but we haven't went into the river"…it's kind of like a figure of speech, like, how am I going to put this, like I've been in the river, like in a canoe, but I haven't been *in* the river with the crawly creatures! [laugh]…My canoe has also got stuck on the rocks, so once in a while I got out and stepped on the rocks and stuff. So, I kind of got in the river, but not exactly up to my hip (Student Participant 2b)!
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>
> I have been around the river and the creek in Pine Creek all my life, and looking' at all the bugs. And when I was younger I am like "hey bugs!"…And I just like looking at stuff like that…I didn't know what they were called before…(Student Participant 5b).
>
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>
> It was neat that we just got to go to different places in our river because we have already seen all of it pretty much, but it was just kind of neat because we got to do this in school (Student Participant 5b).
>
> ~

Students also learned about their local environment and their place by being presented with the opportunity to explore various sites along the Frenchman River, expanding their mental map of the region. As exemplified below, this approach helped them to "recognize that the river doesn't end in the Eastend community" (teacher participant EE).

[25] Environmental education programming has been identified in literature on community education and sustainability (e.g. Diduck 1999; Falk and Kilpatrick 2000; Lave and Wenger 1999; Ministry of Environment 2002) with reference to three possible types of educational contexts: the first being formal education, education through school curricula and within recognized educational institutions; the second is non-formal education, describing organized learning that exists outside of traditional school settings; the third being informal education, which arises from daily routines. Although students were part of a recognized educational institution, learning in the context of the ecological monitoring program touched on all three types of learning.

> I just thought [the river] ended somewhere… it was just like, "okay, yeah the dam, it comes out of the dam and then that was it, it just kind of ended…" [The monitoring program] just kind of helps you to learn what's in the river, what the river's all about… (student participant 7b)
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> I didn't actually know where the intake and the output was for the water treatment plant before we went down there. (student participant 5b)
>
> ~
>
> I've never been under the bridge by the second site…And it was really cool to go under there. I've always wanted to, but I didn't know how to go down or how to get up. I don't know I've been on the bridge, I just hadn't been under it until this summer, or I mean this project, so it was kind of cool!…I don't know my glimpse is like, whenever I described Eastend it was like "Oh, there's the water," and "I've been there," but it's more like if I've been more places in this town I know more or I have more of a chance to get to know more of it, so it's kind of cool. (student participant 2b)
>
> ~

Student agency (i.e. going "right into the river" (student participant 2b)) was also central to learning about river morphology as illustrated in their comments below:

> I learned I could go swimming. [laugh] I learned that the river isn't just kind of like the same depth all along, it changes. I kind of knew that before but I didn't know it could change so, or be so different. We tended to pick the deep spots. We are so smart [giggle]. (student participant 4b)
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> ~
>
> I never really knew that the Frenchman River could be that deep. And boy did I have an experience when I got to do the river morphology! (student participant 4b)
>
> ~

From the perspective of teacher participants, "the hands-on is an essential part of learning about science." Similarly, for students "just going into the river" was more effective at generating interest in the material being taught than the in-class work, and they also conveyed an appreciation for being able to collect their data first-hand as a way to authenticate the in-class material being presented, and to draw connections between science learned in the classroom and the science they carried out in the world outside of school.

> I actually enjoyed going out more than I enjoyed staying in. That's because I love to work on stuff outside, but I don't spend a whole heck of a lot of time outside, but I do like to learn stuff out there…This was awesome to be able to actually go out and do this instead of someone just coming into the classroom telling us all about this project and then just making us look at this stuff in the classroom. Catching it ourselves - it's just like this is way more fun to catch it yourself and look at it yourself than get[ting] someone to catch it for you.…we actually got to see the critters up close…we got to figure it out on our own, so it was basically a better learning experience. Because I learn better when I can figure it out for myself than when someone just tells me what it is…When [teachers] just say "that's what that is"…I don't really know because I don't get the chance to sit there and examine it myself…I like to prove it first. (student participant 4b)
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> ~
>
> And you can get a lot more out of it than just looking at it, doing it yourself instead of just looking at the outcome. (student participant 7b)
>
> ~
>
> We are actually learning about stuff here. I don't mind science, but I like when you get to go out and do things. (student participant 10b)
>
> ~
>
> We discussed in class how to do everything, and then we actually did it and it was hands-on. I thought it was really well laid out and we learned a lot. (student participant 3b)
>
> ~

In their own words, students described experiential learning in reference to more traditional approaches:

> What I liked most about [the monitoring program] was just going out there and doing stuff in the river…I like that better than just reading it in a textbook. I'd rather be out there doing it. (student participant 1b)
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> ~
>
> I liked it all, because first of all it's hands-on, and you're not reading a book, you're getting out there and you're doing it. (student participant 2b)
>
> ~

Learning as "play," and doing as "fun" characterized experiential learning for students. As reflected in students' experiences and recalled in their stories below, field trip activities were tangible and sensory, valued, remembered, and personal, serving as a cornerstone in the program. Students commented that getting wet was

"hilarious," or that "the only thing that was not good [was] the smelling like fish," and in the same breath, that "getting stuck in the mud was the best part" (student participant 10b). Even those aspects of the program and environmental learning outcomes that students claimed to "dislike" were crucial to eliciting a reaction from them, and in this way, were among the most formative aspects of their experience.

> [The field trip], that was when we got to muck around in the mud. That was awesome…It was cool because, well of course the mud feels cool, and you got to see all these little bugs go into the net and it's like…I knew these were in here but not that many. (student participant 5b)
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> ~
>
> We got to play around with the water and nobody could give us heck for it. (student participant 5b)
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>
> *Researcher*: Was there anything from the program that you would omit?
> *Student participant* (5b): Getting in the quick sand. That wasn't fun [laugh]…when we were at [Johnson's]. Me and [Lissa] went from the other side of the river and we were going to try and see if we could get in there and me and [Lissa] just sunk. And then we came back out and we were like "alright we are going to the other side of the river". Yah, the quick sand sucked but other than that!
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> [Identifying aquatic invertebrates] was fun, kind of creepy though…because they're so small. I never imagined that there would be so many million little creatures on that sheet that we picked up. It is creepy! Because you are swimming in them, it is like their home, and you are invading their privacy and they're attacking you and that makes me scream! (student participant 2b)
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> ~
>
> Being more aware of what was in the water! Because, well we go swimming a lot down in the Frenchman River, and I don't think I'll go as much because there's so many little creatures and they're so disgusting under the big microscope. So, I don't know, it's made me more aware and cautious and scared to death…I think I'll just stick to the pool. (student participant 2b)
>
> ~

From the teacher's perspective, "just being out there and being together...not just individual effort and individual work, but team work as well, cooperation" (teacher participant EE) were important parts of their experience in the program. Similarly, for students, being part of a group, or "just working together" (student participant 2b), made learning a social enterprise:

> That was a great learning experience because then I got to see [the aquatic invertebrates] first-hand and identify them myself, with my group of course. And there's nothing better than a small group of people to figure out what something is, actually really helps me learn a lot better about organisms and stuff. (student participant 4b)
>
> ~
>
> I am a hands-on guy. Just watching I can lose interest but depending on who you are working with you can get more into it. I was like "Yah, I'll do this and you do this"…the outdoor stuff was really fun. (student participant 7b)
>
> ~
>
> Taking the pictures and learning some stuff about the Frenchman River, learning things about the organisms that live there, all the different kinds - it was a chance to just hang out with my friends in a big group and have so much fun. (student participant 4b)
>
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For students, having access to, and use of technical equipment, such as Global Positioning System (GPS) devices, digital cameras, water chemistry test kits, compasses, and chest waders formed the focal point of their field activities, making them feel like they were "participants in real science and a real science project" (teacher participant EE). Some of these experiential tools also helped students to define their environment by quantifying the parameters they were observing. As demonstrated by student and teacher participants in the comments below, the GPS unit was of particular interest because it helped them to reference themselves in space, or to consider where they were situated in relation to their physical surroundings.

> The GPS was interesting. You know exactly where you are. You are in a range of twenty feet, well I think had an error range of twenty feet or something like that. It was interesting to know pretty much where you are exactly. (student participant 9b)
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>
> That stuff was awesome! We were having fun with the GPS. We were being like "it's a big 10-4 Rubber Ducky." It was pretty funny. It was really cool because when we walked through this little path on the first site it exactly showed where we stepped. It was really cool. It showed the path, how we exactly stepped and everything. It was really sweet. (student participant 7b)
>
> ~

> I like to explore and stuff, and [the hands-on activities] gave me a chance to explore the things I didn't even know…Such as like the compass. It was really cool, like I know what a compass was if you point in the right and get it to go that way, but it was more fun to know how to use one than to just point one to the direction and follow it. And the GPS's were really cool because it's a satellite system, and by one little tiny spot in the corner you know where you are in the world, and I thought that was really neat. (student participant 2b)
>
> ~
>
> I mean any time you are out in the great outdoors you get to have a better appreciation or a different understanding. Even just using the GPS system. I know that was one way for [students] to, or even myself to think about our little world in the bigger scheme of things…it took about two or three kids and they clicked in right away "wait a minute they can't be that far north because if the dam was this far north then town had to be," you know so even just reasoning and logic, that way it just sort of I guess touches on our place in the world too. You know, where exactly are we in this globally positioning type system? (teacher participant VM)
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> ~

Literature on environmental education has long advocated that local places serve as ideal laboratories for learning, and that presenting students with opportunities to touch, watch, smell, and listen outdoors in an interactive and social setting may help to reacquaint them with their surroundings (e.g. Mayer 1995; Smith and Williams 1999). For students in Eastend, ecological monitoring was distinguished by both physical experience and social exchange - whether peering over a net of crayfish, hearing the sound of a nearby riffle, clutching the large, textured shell of a freshwater mussel, complaining about the pungent smell emanating from their sampling buckets, or sharing in laughter as water seeped into chest waders of a classmate. This research, therefore, supports existing views that environmental education is most effective when it involves experiences that physically immerse the learner *in* the environment, rather than simply teaching *about* the environment (Palmer 1997). Creating opportunities for physical engagement and social interaction through ecological monitoring was one mechanism by which the project was able to produce an impact.

4.4 Contributions of a Learning Community in Acquiring Environmental Knowledge

> "A *learning community* can be incorporating specialists from our community…a biologist from the park or a local rancher who has some expertise. It's involving everyone who can contribute to their education, and then also not just the people but the resources within the community…having our river here, that's a real resource that a lot of places don't have. I mean we walk, like I said, half a block and be down there to be doing some research or to use it for classroom purposes. So, *learning community* is, to me, just everything that's in the community that we can learn from and learn with." (teacher participant VM)

Knowledge gained about the environment emerged through relations that connected participants to one another, the project, and their communities. Learning was both individual and collective, consisting of numerous hierarchies, or scales of social interaction. As illustrated in Figure 4.1, learning occurred individually (including in the form of meanings acquired through students' experiences of participating in the project, and which are discussed in further detail in Chapter 5), and also resulted from participation within the class, as members of a group. Knowledge acquisition was also characterized by interaction at the school level (spreading to other students and teachers), at the community level (including parents), between schools and communities (i.e. at the regional level), and at the broadest level, through networks that were developed out of the sharing of ecological data, curriculum materials, information, and experiences between the school, and myself as the facilitator of the program, the FRBP representatives, and others interested in students' monitoring activities (refer to Table 4.2. for a list of members of these groups and information dissemination activities). A benefit arising from the FRBP partnership included extending this learning beyond the school limits into other peripheries: into the community through local meetings; regionally, through newsletters and community linkages between members of the steering committee; as well as to other provincial and national agencies, such as the Royal Saskatchewan Museum, the Ecological Monitoring and Assessment Network, and the Canadian Museum of Nature. The transfer of knowledge through media such as students' photomural display and the various other avenues presented in Table 4.2, was an important part of expanding the scope of the learning community, as one project participant in Eastend described, "taking what's

going on with the FRBP and the project within the school here, and broadening it out" (participant 14).

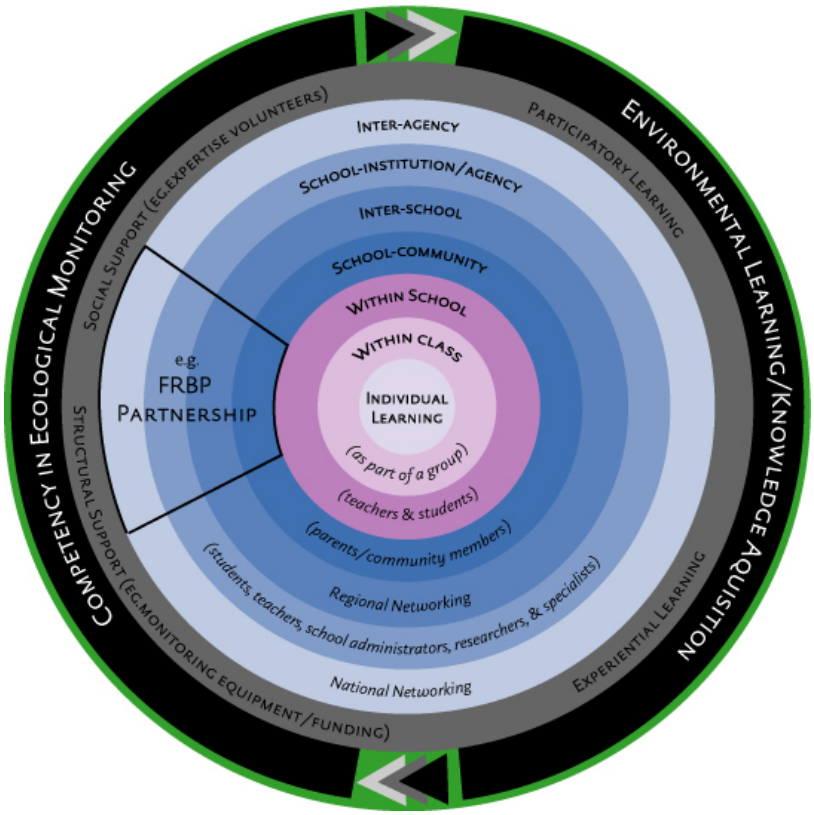

Figure 4.1: Hierarchies of learning within the learning community (Source: author's conceptualization).

This learning community also provided what I refer to as the social and structural support - in the form of expert guidance, monitoring equipment, and funding - necessary to implement ecological monitoring in the schools, and ultimately to facilitate experiential and participatory learning as an outcome (see Figure 4.1). Some of the challenges for Val Marie and Eastend are concerned with what the schools' administration and teachers have identified as common to "small town[s], small school[s], [with] small budget[s]," without the resources. According to the principal at Eastend, "that fits in with money, that fits in with expertise, that fits in with facilities" needed to carry out activities such as ecological monitoring. School participants also highlighted that technological instruments, such as GPS devices, digital cameras, and water chemistry test kits are learning tools that are "normally not found in Grade 10 science."

Table 4.2. Expanding the learning community through formal project information dissemination.

Activity and Details
Within Class: ▪ Respondent validation - presentation of research findings to Science 10 Class, EE
Within School: ▪ Presentation to Board of trustees at Eastend School Division Meeting (topic: monitoring program outcome and research findings), March 2005 ▪ Photomural display at the Eastend School Division Office, Winter 2004/05
School-Community: ▪ School newsletters, EE, September 2nd and October 28th, 2004 ▪ School newsletter, VM, September 2004 ▪ Shaunavon Standard (Shaunavon Weekly Newspaper), "Eastend Enterprise: Ecological Program," September 8th, 2004 ▪ Photomural display at "Muffin Morning," Eastend School, Thursday, October 21st, 2004 ▪ Photomural display at the Eastend Credit Union, Fall 2004 ▪ Presentations at FRBP Community Meetings, EE & VM, March 10th, 2004
Inter-School: ▪ Data exchange and sharing of program implementation strategies between VM and EE Schools (facilitated through myself as program liaison), November 2004
School-Institution/Agency: ▪ FRBP logo design contest, September to December 2004 ▪ FRBP Steering Committee Meetings (monitoring program updates), April 14th (VM), 2004 and December 15th, 2004 (EE) ▪ Biannual newsletter of the FRBP, *Biodiversity Update*, Fall 2004 issue ▪ Biannual newsletter of the FRBP, *Biodiversity Update*, Winter 2005 issue ▪ Resource Sharing with Biosphere's (in Partnership with CMN) Adopt-a-River Project (monitoring protocols and curriculum materials), December 2004 ▪ Provision of data to Saskatchewan Environment,* October 2004 ▪ Ecological Monitoring and Assessment Network (EMAN): "The Frenchman River Biodiversity Project: A Community-based Study of Sustainability," in *The E-MAN Monitor*, Vol. 3, Issue 1, Feb. 2005, available at: http://www.eman-rese.ca/eman/reports/newsletters/monitor/vol_3_num_1/page11.html ▪ Quarterly newsletter of Nature Saskatchewan, *Nature Views*, "Learning about Place and the Environment Through School-based Ecological Monitoring in the Frenchman River Basin, Saskatchewan," Issue 144, Winter 2005
Inter-Agency: ▪ Newsletter of the Canadian Museum of Nature, *Nature Scene* ▪ Quarterly newsletter of the Saskatchewan Watershed Authority, *Prairie Update*, "Community-Based Biodiversity Study Takes Root," Spring 2004, Vol.19 ▪ Journal of the Canadian Plains Research Centre, University of Regina, *Prairie Forum*, Sutter *et al.* 2005: "Mutual Trust in Community-Based Ecosystem Management: Early Insights from the Frenchman River Biodiversity Project," 30(1). 73-84

*As noted earlier, Saskatchewan Environment required that schools share their ecological data, and thus the provision of data was not a voluntary form of disseminating information.

With equipment, logistical support, and the integration of a diverse portfolio of knowledges and experiences that accompanied this partnership between myself (representing the Department of Geography and the University of Saskatchewan), the FRBP, and the schools, this university-community-school linkage opened corridors of opportunity that would have otherwise been much more difficult for these rural schools to access independently, particularly for teachers, where "time, money, and energy" are barriers to starting new projects (participant 14). This support not only made ecological monitoring possible in the short term, but the knowledge gained through the experience of participating also included the practical skills necessary for schools to be competent in monitoring the river over the longer-term (to which Proshansky *et al.* 1995 would refer as environmental competency), with the potential to contribute to continued environmental learning when all outside project participants are no longer actively involved in Val Marie and Eastend (see Figure 4.1). In her dual roles, both as a science educator and a rancher in the community, the teacher in Eastend explained that "you learn from what you are doing…again [this is] something I haven't done, so this benefits me – as a teacher and personally."

In contrast to my suggestion that the presence of outsiders may have discouraged participation within the ecological monitoring program (as discussed in Section 4.2), the ecological monitoring program itself presented a very different picture of the potential benefits ensuing from a partnership between outsiders and local people. Students were exposed to different ways of thinking about, and observing the familiar, as one student described "I like having people come in from somewhere else coming to talk to us about something around here because they have a different outlook on it than we do" (student participant 4b). For Science 10 students in Eastend, both the presence of the FRBP and my own involvement in this action research initiative with the school played an important symbolic role. Just knowing that people from elsewhere would demonstrate interest in their school and (as portrayed by one student) "a little town of Eastend out of all these other towns" (student participant 8b) not only contributed to students' sense of pride for their community, but also to the value that they attached to learning about the Frenchman River – in alignment with students' view that "local learning" is "more important than something that you don't have anything to do with" (student participant 6b). The idea that the FRBP would, as articulated by one student, "choose a grade 10 class to actually contribute to a project as big as this…to contribute

to something, some of our own data, something that we got to find out for ourselves and that will actually be used" (student participant 4b), added an element of significance to their work. In effect, students' monitoring of their local river as members of a learning community was a case of young people doing adult-like things – entering that community of privilege to be part of a larger research project.

> I liked getting out there, and actually it's kind of cool to be like a scientist, or whatever you want to call it, for a day. Just being out there on an actual field trip in Grade 10 is pretty cool. Getting picked [to be part of this project] feels special (student participant 8b)
>
> ~
>
> I think it's very fun because we have never been [part of a research project] like that before. Well, I don't know if we ever got picked for anything, I am not sure, but nothing to do with an ecological study…somebody actually picked the Grade 10 students from Eastend school! (student participant 6b)
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> ~

Although at the time of monitoring the actual role of the school's data within the FRBP was still being determined, students expressed concern for the accuracy of their own data analysis. As one student articulated, the perceived importance of the project came with the realization that monitoring water quality in the Frenchman River was not, in her words, "just for my knowledge…it [was] for other people's knowledge" (student participant 1b), and for another student, with the recognition that "it's kind of cool to share what you learned with others" (student participant 8b). For students in Eastend, ecological monitoring represented more than just a class project involving an in-depth field study, but rather, as suggested by the participating teacher, the project taught them that research "doesn't just happen in a day, it takes a lot of work and a lot of time," testing preconceived notions that science was "just books," but instead that "science goes beyond the realms of the classroom - it's out and about and [students] can become part of it (participant 14).

> I think it's really exciting because we're actually helping in something really important for once…Not just for school, but for other people, other important people. (student participant 1b)
>
> ~
>
> Both their data and our data is all going in on this research project and it actually does kind of count. It's not just "well

> here's what some grade 10's found out but we don't believe it" kind of thing. (student participant 10b)
>
> ~
>
> It's just kind of cool to think that people actually asked Eastend students. It's kind of cool, you know to think that you're contributing to the research data. (student participant 10b)
>
> ~
>
> It was really cool to be able to contribute to a big project that is actually of some importance, rather than something that is not really going to go any further than Eastend. This is going to go a little further than just Eastend. This is a whole Frenchman River Watershed thing…I mean it is important to have something just in your community, but this includes a little bit more, this is a little bigger. (student participant 4b)
>
> ~

Although ecological monitoring in the communities of Eastend and Val Marie remained largely independent from one another, simply *knowing* that the other school was engaged in a common endeavor also helped students to see the Frenchman River as part of a larger, integrated system that extended beyond their community, and contributed to a sense of joint purpose for their involvement with the project. Despite the existing geographic distance and separate identities between these distinct communities, this agency enabled the physical dimensions of their watershed to acquire a largely human component in the eyes of students. In being part of the project students acknowledged that "if you want a better community then you have to be part of the community" (student participant 2b) - a form of membership or belonging that the principal described as contributing to students' "self worth." One student also came to recognize that by participating with adults in a joint research project "younger teens can feel the same way [as] other older citizens," drawing comparisons in stating "we kind of look up to the older people" in the same way that "the people that are younger than us, like the kids, like the kindergartens, they kind of look up to us" (student participant 2b).

> I think they really enjoyed having a different personality in their classroom and they enjoyed having the opportunity to learn with somebody and to see their teacher learning and at the same time, as you said earlier, you are learning from them too. And they see that relationship and they think yah, well that gives them some self worth, and they think "oh we are part of this important project, and we are kids and we are just as important as an adult," which is the truth. You can tell them that all you want, but until

> you actually give them some ownership, it's not there right, it's just not happening. (school principal EE)
>
> ~

These symbolic meanings, such as a sense of belonging and privilege are critical to the way in which people experience, learn from, attribute meaning to, and remember their surroundings (see, also, previous work in the fields of rural sociology and environmental psychology, e.g. Glendinning *et al.* 2003; Sixmith 1995). The significance of the project to participants is clearly articulated by one student who states, "our school will remember it, and the classmates will remember it, and I will remember it" (student participant 2b).

A learning community, therefore, plays many roles. A collaborative partnership between participating communities and outside interest groups creates an environment in which local people can learn and benefit from the knowledge, experience, and resources afforded by outside agencies and groups. In this case, the academic community along with local representatives helped to advance a school-based ecological monitoring program, and the PEEL that resulted from it. The Eastend and Val Marie experiences demonstrate how collaboration can provide the impetus to initiate a stewardship project in schools and communities that may otherwise be reluctant or hesitant to carry out monitoring themselves, particularly in the rural setting, where lack of tangible resources and "expert" guidance are limited and their absence may serve as a barrier to exploring new projects. At the same time, agencies and groups or individuals, such as the University, the FRBP, local schools, and myself gain a privileged vantage point into the social fabric of these rural communities, and are able to integrate knowledge held locally into the practices of their institutions, and through these relations, learn how to better work within the expectations and priorities of local people on initiatives that affect the focus community. The role of a learning community also includes creating a space for negotiation and compromise among all participants in order to overcome obstacles, work within existing socio-political and spatial boundaries, and despite these sites of divergence, to expand learning within a socially inclusive context. In the context of a high school curriculum, for teachers this also means negotiating the conditions of participation with outside interest groups, within a framework that is sensitive to the needs, interests, and values held by local people. Having local voices as part of this partnership during the negotiation phase helps to keep outside intentions in check, and ensures that local interests are met. A learning community, by definition, is built on

social interaction and inclusion. For students, social inclusion within a research project traditionally undertaken by adults alone opens doors to participatory learning, which includes a significant symbolic role – personal and collective meanings that contribute to the perceived value that students attribute to their newly acquired responsibilities as environmental stewards.

4.5 Conclusion

In the context of this project, it is important not to reify the idea of this learning community into something that it was not. Although it may have been conceived as a collaboration among people with common goals for education and stewardship, in actuality, learning outcomes and practices were constructed from people with different ideas, expectations, and priorities. The experiences drawn from Val Marie and Eastend highlight that there must be an initial effort to facilitate discussion between project participants, from which local community boundaries and objectives may be shared and established, and opportunities for negotiation and compromise between participants may be presented. In Eastend and Val Marie, participation in the ecological monitoring program was not only concerned with meeting target objectives for environmental education and data collection, but also involved the learning that arose in the process of achieving those objectives, including how to work within the boundaries of each group and "meet others on their own terms" (Moote *et al.* 2001, 98). Despite a noticeable disconnect between the FRBP and the participating schools, as well as between schools, the tangible, educational, and symbolic outcomes of intergenerational, school-community-university collaboration were nonetheless mutually beneficial. It is my perspective that in the eyes of farmers and ranchers, the schools' activities may have helped to legitimize the research goals of the FRBP, where the communities' wariness about research findings may have been somewhat offset by the anticipated educational outcomes for students. The linkage between the FRBP, the University of Saskatchewan SSHRC project (led by Dr. Bell and Dr. Reed), and my own Master's research activities also provided schools with the necessary resources and logistical support to make ecological monitoring viable within the context of a rural, high school curriculum, and thus created fertile ground for the acquisition and sharing of knowledge. Participatory learning as an outcome surfaced in many forms - students working together to allocate tasks within their research teams, the spontaneous involvement of the local bus driver

(and rancher) on the field trip, a parent enquiring about the photomural during "muffin morning" at Eastend School, or alternatively a park's employee engaging in meaningful dialogue with the local science teacher in Val Marie are illustrative of the many facets of knowledge transfer within this learning community. Finally, this partnership produced experiences that led student and teacher participants to learn about their environment, and also engendered a symbolic significance that added new meanings to the stewardship activities in which they were engaged – both with, and for their community.

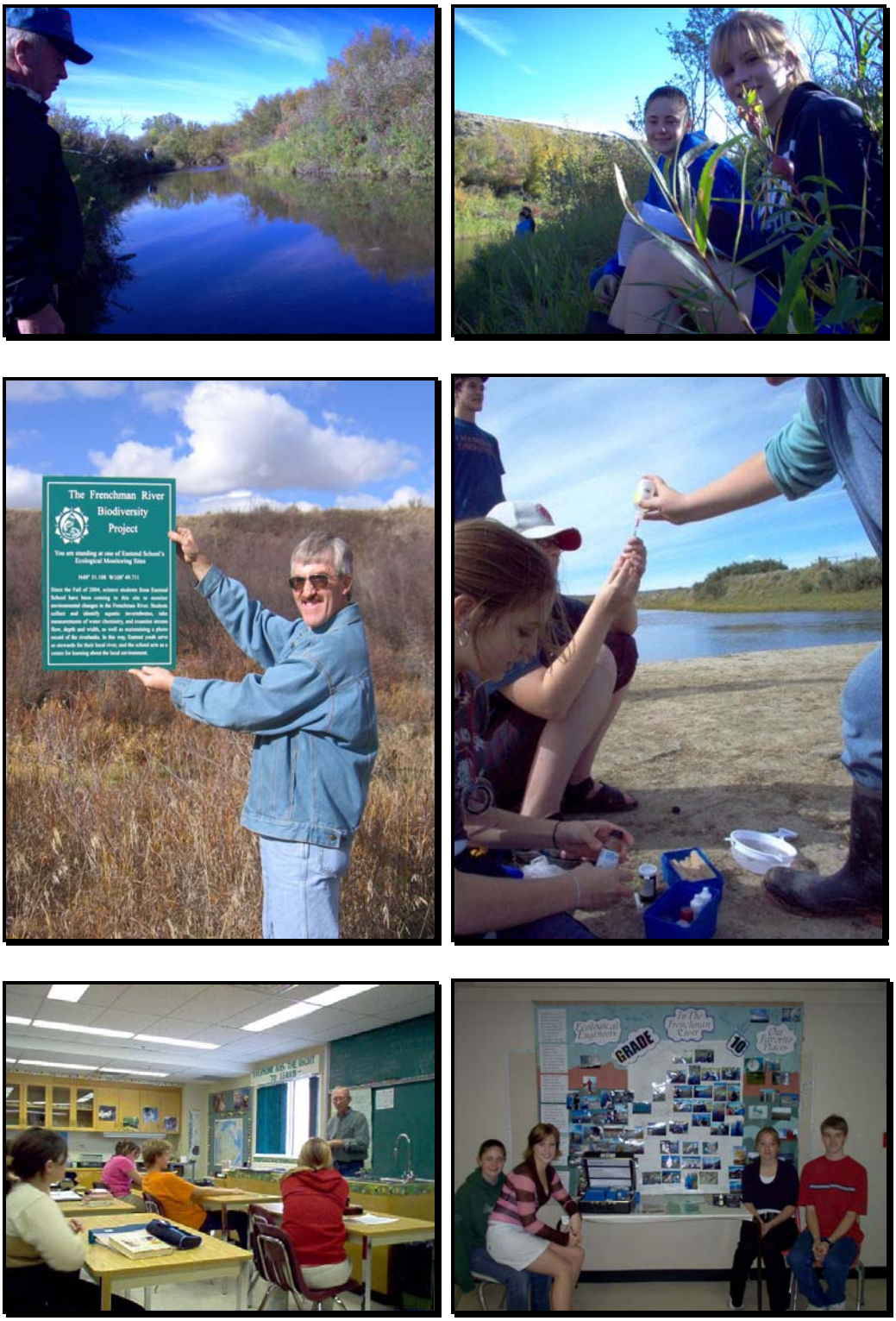

Plate 3: A learning community in action at Eastend School.

CHAPTER 5: UNDERSTANDING THE MEANING OF PLACE

5.1 Introduction

In this chapter, I describe the impact of the ecological monitoring program through the *lens* of student participants. Prior to my fieldwork, I had expected a direct shift in how students would define their place through photographs and interviews, from pre-program to post-program. I anticipated a possible social focus in their early descriptions of place to an emphasis on themes of nature or the environment in the latter. Rather, the pre-eminence of social relations remained an enduring theme in what students described as being important to them. Furthermore, this research revealed the process by which sense of place is formed for students and articulated by them, lending insight into how various aspects of this program - both participatory and experiential - had an impact. This process elucidates how the experiential, social, and symbolic outcomes introduced in the previous chapter may be directly attributed to their participation in the project.

In Chapter 4, I examined students' environmental learning outcomes, and the role of a learning community in facilitating the acquisition of environmental knowledge. I placed emphasis on the participatory and experiential aspects of the project. In this chapter, I shift my focus to assessing the meaning behind students' experiences and describe their contributions to students' sense of place. To do this, I begin by providing a more conceptual overview of the process by which meaning is constructed and articulated by students, before presenting a snapshot of how they defined their place, based on their experiences growing up in Eastend. Last, I consider the impacts of the program on students' sense of place (as it has been defined by them), drawing linkages between participatory and experiential environmental learning and place-making, and present a simple model of transformative learning that describes how building upon sense of place may translate into future commitments to stewardship.

5.2 Understanding the Meaning of Students' Experiences

5.2.1 The Process of Meaning Construction

> "…I'd just say this is my place, but there are two different sides to my place; there's my inside place and my outside place." (student participant 2b)

From students' photographs and accompanying narrative (refer to Appendix E for examples from the data analysis table), place meanings emerged in the data as either tangible elements constituting place, or as cognitive or emotional outcomes (such as memories, familiarity, sense of accomplishment). [26] For students, this distinction can be made between what one student referred to as "my outside place" versus "my inside place," or correspondingly, "what I do and why I do it" (student participant 2b).

> I think that my place is all the same, in all, but there's two different kinds of place, there's the outside part that's like my house and stuff, and then there's the inside part, which is my goals…but there's two sides. The outside part, like what people see, and then the inside part is what I achieve…and more inside than just what other people see…my accomplishments. (student participant 2b)

~

As shown in Figure 5.0, experiences are the vehicles by which meaning and value are added to place elements (as one of, or a combination of practices, activities, or events, temporally and spatially bound references, and other social constructions), leading to emotional or cognitive outcomes. Ultimately these outcomes contribute to the social-psychological dimensions of sense of place, which have been defined by the work of Stedman (2002) and others (e.g. Proshansky *et al.* 1995) as including place satisfaction (i.e. attitudes of like or dislike) and place attachment (i.e. place identity). Stedman (2002) integrates the sociological concept of identity with the cognitive and affective notion of attachment from the field of psychology in his definition of sense of place. More specifically, place attachment is defined as the cognitive or affective link between people and their environment, and is an expression of the identity that people have developed through associations with a place, affecting how they define

[26] Ahearn (1994) describes *meaning* in reference to place as the ability to develop intimate associations with spaces, or landscapes (i.e. locations as sources of knowledge and memory, and subsequently significance and importance) that are retained beyond the duration of the interaction.

themselves in relation to it (Kruger 2001; Ryden 1993).[27] Place satisfaction has been described as feelings of value for a place with respect to its ability to meet certain identified needs (Guest and Lee 1983 in Stedman 2003), to which I often refer in this thesis as "appreciation." In Section 5.3, I provide a complete list of place elements and cognitive and emotional outcomes identified by students as constituting their sense of place (refer to Tables 5.0 and 5.1, respectively).

[27] In environmental psychology literature (e.g. Proshansky *et al.* 1995; Stedman 2002; 2003), the concept of "place attachment" is often used synonymously, or in conjunction with "place identity" – a cognitive sub-structure of self-identity (meanings we attribute to ourselves), but in relation to particular places.

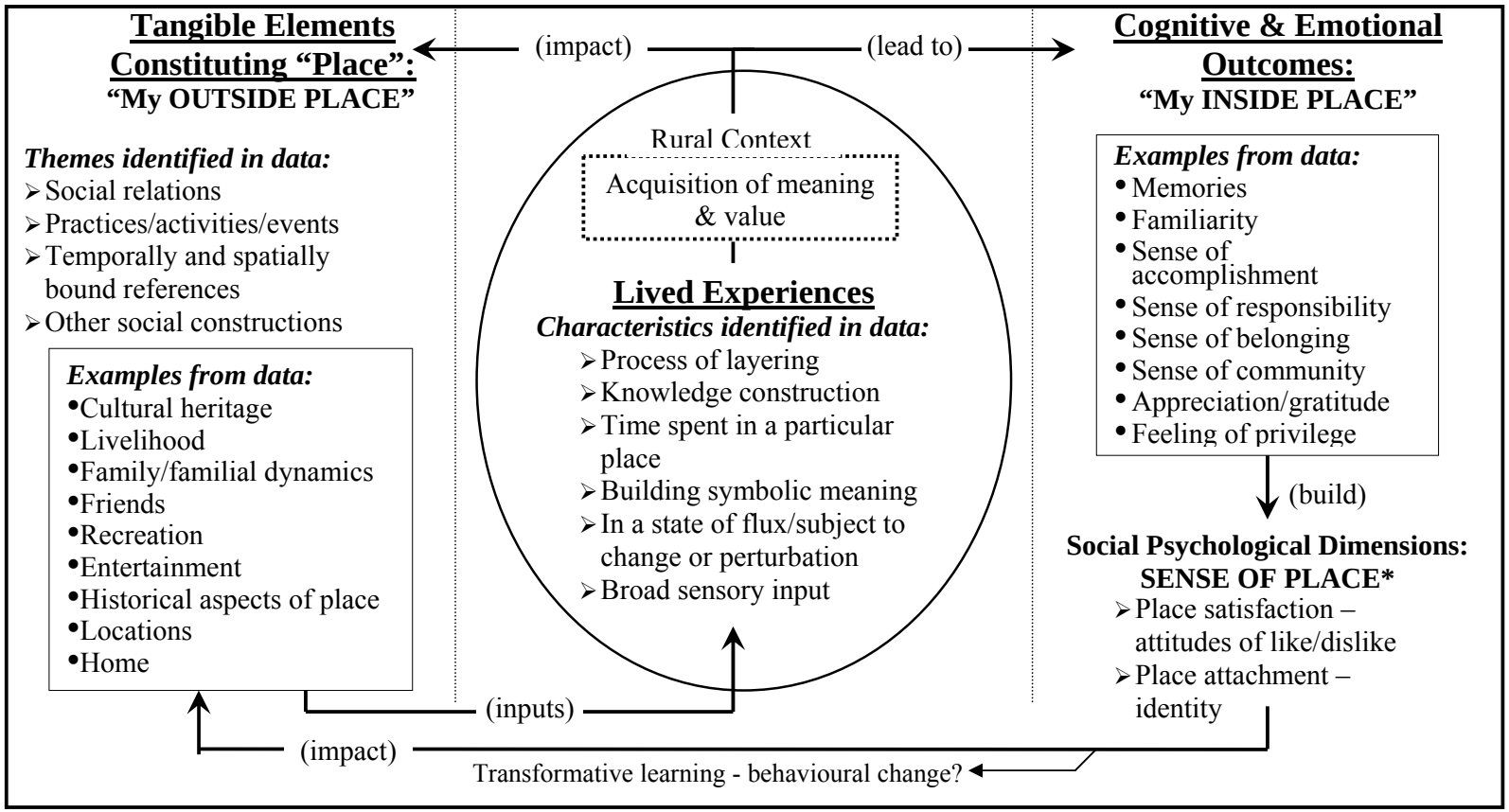

Figure 5.0: The building of sense of place (Source: author's conceptualization; refer to Appendix G for complete data sets).

Note: Portraying the many elements and processes that contribute to the building of sense of place required breaking down these components into the simplified diagram shown above. However, it is important to note that this process of meaning construction is not linear, but rather a holistic, simultaneous interaction of these elements.

*Social psychological dimensions of sense of place were derived from literature (see Stedman 2002), and guided my analysis of student data.

As articulated by one student participant who commented that "the overall experience is what place means to me," the lived experience forms the basis for how students relate to their surroundings (student participant 2b). Students' lived experience serves as a lens through which space is negotiated and their surroundings are interpreted. In other words, it is also this personal history that students have with places that lends to the ability for place identity (one's perception of the self in relation to the physical context in which lived experiences unfold) to materialize (Proshansky *et al.* 1995; Stedman 2002). It is through these lived experiences that place acquires significance as space becomes imbued with meaning (Tuan 1977). As mentioned above, this formative process is the result of an experiential interplay between place elements, such as a river, and the cognitive or emotional outcomes that shape the nature of participants' bond with that physical space, or their landscape more specifically.

I have identified several characteristics of students' lived experiences that contributed to the process of creating meaning (see Figure 5.0):

- *Process of layering*: Experiences build on one another through the enactment of students' daily lives. For example, memories of childhood experiences by the river are overlaid with more recent social activities associated with adolescence at the same sites. In a similar way, school-based activities also have the potential to overlay students' previous solitary, social, or family-oriented experiences.

- *Knowledge construction*: I refer to the acquisition of meaning as a form of knowledge construction – a relationship that became evident in my analysis of meanings that students' attributed to places. This interpretation is supported by Wenger (1999) and others (e.g. Greider and Garkovich 1994; McCormack 2002). In describing meanings that constitute students' "inside place," I use the terms cognitive and emotional outcomes to distinguish between these two possible types of mental faculties. The Canadian Oxford Dictionary describes cognition as the mental faculties of perception, thought, reason, and memory, and as being distinct from emotion and volition (Barber 1998). My classification for cognitive and emotional outcomes also corresponds to

Bloom's (1964) well-known taxonomy of respective learning domains: cognitive pertains to mental skills (knowledge), and affective pertains to growth in feeling or emotional areas (attitudes).

- *Time spent*: I refer to time spent in a particular place as the temporal characteristic of the lived experience, or from students' perspective, "[places] where I spend most of my time" (student participant 1b).

- *Building symbolic meanin*g: Arising from my analysis of students' photographs, this characteristic reflects the predominant symbolic expression of place meanings through living (e.g. pets) and non-living subjects (e.g. street signs, sites, and other objects). The way in which people draw associations and meanings through these interactions with their environment is also explored in other work, particularly in reference to symbolic interactionism (e.g. Beal 2002; Blumer 2004; Johnston *et al*. 2000; Prus 1997, 1999). Symbolic interactionism conceives of individuals' social life as a discourse between the internal and external experience (Johnston *et al.* 2000). It is a way of thinking about how people attribute significance to, and derive meaning from interacting with each other and their surroundings (Johnston *et al*. 2000), as well as how they convey that meaning to others (Prus 1999).[28] The latter is discussed in Section 5.2.2, providing a more detailed account of how students articulate these place meanings symbolically (see also Figure 5.1, page 102).

- *State of flux*: I refer to "state of flux" as the ability for interactions, activities, and events in one's life to have the potential to define, and redefine one's relationship with one's surroundings. The importance of state of flux to the lived experience is echoed by one student who states:

> I was picturing what I did everyday because…what I do every day impacts my life somehow…and everyday I listen to country music, so I guess that's kind of like if I didn't

[28] Symbolic interactionism is closely aligned with Vygotsky's (1978) socio-cultural theory, which places emphasis on the centrality of signs and symbols as mediators in the production of knowledge and meaning. These signs and symbols comprise a system of higher order thought that governs the way a particular social group learns, contemplates, and then communicates cultural values (Smagorinsky 1995).

> listen to country music I wouldn't have a place, maybe...I have to have music. (student participant 2b)
>
> ~

This passage illustrates how place perception is not simply influenced by what is constant in one's daily life, but also suggesting that one's experience could change if certain elements were to be absent. In this way, place meanings are always evolving, and subject to change.

- *Broad sensory input*: We rely on our senses to verify our physical experiences and to construct our reality. Sensory agents, which have long been recognized for their ability to evoke memories and feelings (e.g. Ryden 1993; Tuan 1977), have also shown to be powerful in influencing students' experiences growing up in the country by shaping their perception of place. As demonstrated in the example below, this process lends to place attachment and satisfaction, namely in connection to the rural setting:

> I think that there is a lot more to do out in the country…it's a lot more peaceful at night, because you don't have to hear cars going "broom" by your house...With living out in the country I think it's really nice at night and in the mornings, like the sunsets and sunrises I guess, and the moos...Just the sight of it. (student participant 1b)
>
> ~

A broad range of emotional or cognitive outcomes arise from students' lived experiences that shape their sense of place, or affect how students relate to their surroundings. Although the complete list of these outcomes is located in Table 5.1, I will illustrate how a few of these cognitive and emotional outcomes fit into the process of meaning construction. As reflected by one student, having a sense of responsibility is an example of one of these important outcomes, which results from a practice or activity:

> I think [my horse] is meaningful because she is my responsibility. (student participant 1a)
>
> ~

For another student, being permitted to drive legally is perceived as a privilege, which at the same time affords the student with a sense of freedom or independence, as demonstrated below:

> …I just got my learner's [license]…next year I will be able get my [driver's] licence and drive with all my friends and family and stuff, and I don't have to just drive with my mom and dad. Like, I can drive with other people too, like my brother...We can go on road trips too. (student participant 6a)
>
> ~

For many students, these emotional outcomes are situational and arise out of events or practices in their daily lives. As demonstrated in the example above, the significance of these experiences also speaks to their social positioning as youth and to their desire to have adult-like privileges. Similarly, sense of achievement and feelings of aptitude arise out of the practice of playing sports for many students:

> [Basketball] is just a sport that I like and I'm, I guess kind of good at…it's the only sport that I've ever really put effort into. (student participant 1a)
>
> ~
>
> Volleyball I'm pretty good at. I was one of the best players on the senior and junior team last year. I was captain of the junior team... And I got asked to come play on the seniors - on the A line there. And I play badminton – me and [Josh], we made the districts...Track, I made the provincials...Jumping, throwing...High jump, long jump. And then I throw javelin and discus, and I run the two-hundred...It just makes me realize that I am pretty good at them, and that I should continue trying to be good at them. (student participant 7a)
>
> ~
>
> One of my best qualities is hockey...I went to hockey camp for the Lethbridge Herrington's....I am already invited back to next year's. (student participant 7a)
>
> ~

These feelings of independence, privilege, and accomplishment that result from the place-based activities in which they engage, contribute to students' attachment to and satisfaction with that place. To extend this discussion, it is useful to explore the relationship between attitudes of like/dislike - the emotional faculty of satisfaction - and the cognitive outcome of competency to recognize the potential for the initiation of new behaviours. In the case of this research, sport represents one example of an important part of students' daily life. As suggested above, a perceived aptitude for this activity propels students to strive to accomplish their goals in this interest area. Feelings of competency reinforce the significance of these activities as valuable parts of their life experiences:

> When I think of place, I think of what I do, and why do I do that. And I think I like to draw, I draw because I like to draw and I think if you like something you're good at, you should do it. (student participant 2b)

~

The idea of introducing new practices, acquired through their lived experience, enters into this active process of meaning construction and builds feelings of competency in relation to that practice - whether a sport, or in this case an ecological monitoring project - with the opportunity to create new meanings. Empowering students with the skills and knowledge to be stewards of their river may set the stage for a willingness to independently engage in environmentally responsible behaviours - an assumption that I explore further in Section 5.4.

Greider and Garkovich (1994, 2) describe human relationships with the environment as "cultural expressions used to define who we were, who we are, and who we hope to be at this place." The process of meaning construction that I describe in this section is in response to a need to understand how place identity is formed for these participants and how new experiences play into this process. Because participants' existing cultural and personal meanings shape the way in which they perceive and understand their world, this identity must be characterized and its development elucidated (i.e. what these meanings are, and how they are developed) before we may understand how a stewardship project may influence students' perceptions of place. In effect, this model represents a way to organize the outcomes of participatory and experiential environmental learning and relate them to the social psychological dimensions of sense of place for research participants, while taking into account their identity as inbuilt to this process.

Socio-cultural theorists also support this approach to evaluating learning, calling for an examination of social relations (as part of the "outside" world) and internal cognitions as part of an integrated system (Cole 1985). In the next section, I begin to explore the bridge between the "outside" and "inside," or the social and individual, through students' use of language and symbolic representations (see also Wertsch and Stone 1985).

5.2.2 Articulating Meaning Through Photographs and Narrative

"There is a story behind every one of them." (student participant 8b)

Students' photographs and narrative describe vignettes, inclusive of characters, their roles, and the geographic and social setting through which meanings materialize. For youth, the meaning of place emerges as a series of stories, told anecdotally by them and echoing their subjective interpretation of all aspects of their social reality growing up in, or near the town of Eastend. As an "outsider" conducting research within an unfamiliar community and geographical context, I interpreted students' lived experiences by working with them to bridge our different understandings, particularly of environmental values, agriculture, and rural youth life resulting from our divergent personal histories. Thus, by articulating their sense of place symbolically through photographs, students were able to show how they experience their place and construe meaning from it, both individually and collectively. Again, by asking students to take photographs of what place means to them, I intended to reveal what students define as being important to them, how these meanings were constructed for students, and finally how they may have been influenced through their participation in the ecological monitoring program. This approach is supported by the claim that "learning is culturally shaped by the social environment in which it takes place" (Smagorinsky 1995, 193), and that cultural values are reflected in tools and symbols that individuals use to order the relationships and activities in which they engage.

Within students' photographs, an object, location, or icon carried with it multiple meanings, each layered upon the other, providing a narrative of that cognitive experience. Students' material possessions were presented as largely symbolic place elements, as exemplified by one student's portrayal of a fish bowl as combination of the thoughts and feelings it elicits, including responsibility, familiarity, and for its associations with family. Similarly, one student identifies the "Valley of the Hidden Secrets" and "Cypress Hotel" signs for their symbolic representation of her hometown, or where she grew up (see Figure 5.1). The way in which student participants make sense of their surroundings through the use of symbolic representations echoes Tuan's (1977, 6) suggestion that knowledge and experience can be direct and personal, or conceptual and mediated symbolically through the use of objects, people, and locations in the physical environment.

Figure 5.1: Street signs were used to communicate meaning, identified by one student as being symbolic of Eastend (student participant 10a).

Students' language of communication - through the use of words such as "cool," "nifty," "awesome," "gross," or "dirty" - also contributed significantly to the form and nature of my understanding of their experiences participating in the program. In some instances, student participants' articulation of meaning did not necessarily accurately reflect the true meaning of the word, but for their cultural or age group, it bears a particular meaning that they had hoped to convey.[29] While not necessarily commonly spoken among adults, the words employed by student participants were characteristic of the language of this group, and subsequently, in this thesis I use words to define place that reflect as closely as possible the voices of these student participants.[30] Students' use of language also helped to guide my interpretation and classification of their specific meanings; words or phrases such as

[29] Work by Bakhtin (1981) highlights that words do not simply carry dictionary meanings, but rather that words convey meanings that are specific to the individual communicating them and the unique social context in which they are understood by the individual and expressed. In illustrating participants' language of communication, I draw on the example of one student's use of the word "redneck." This term, which often carries a disparaging connotation associated with a set of opinions or behaviours of people belonging to a particular socio-economic class (and not based on fact), was used in the context of this research, to describe the sense of pride relating to a cultural group and geographical context with which the participant identifies, typical in this case of rural producers in the Canadian Prairie.

[30] Because young people have "ways of seeing" through their own cultural lenses, and experience the world differently than adults, it is acknowledged that people conducting research involving youth must be sensitive to these differences, particularly in reference to the interpretation and representation of research findings (e.g. Leyshon 2002, 180; Matthews and Limb 1999; McCormack 2002). Again, it is with this reasoning that I attempt to integrate the vocabulary, narrative, and photographs of student participants themselves, wherever possible throughout this thesis.

"reminds me" or "remember when" were suggestive of memories, "represents" or "symbolizing" as symbolic representation, or "growing up" as meaning childhood.

I identified several themes that emerged from students' photographs, revealing the aspects of their environment or surroundings that had meaning for them, or were of significance, including (not represented as a function of relative importance) their "Material World," "Sport," the "Built Environment," their "Social World" and "Family Farm/Pets," and the "Prairie Landscape/Natural Environment" (Refer to Appendix G for a presentation of these six photographic themes in the context of the larger data set collected on sense of place). The first, "Material World," included those wide-ranging material artefacts or objects that can be identified as part of students' daily life, as exemplified by photographs, such as a truck, fishbowl, computer, or an X-box. The second theme, "Sport," I describe as those activities in which students engage for the purpose of recreation (both competitive and leisure), as well as for entertainment, including activities such as basketball, volleyball, foosball, golf, cycling, ice-skating, hockey, or curling. The third theme represents those structures, such as buildings and roads, which can be classified as constituting the "Built Environment." The fourth theme, "Social World," includes photographs that symbolically portray the importance of various aspects of students' social relations, such as their family, friends, familial dynamics, or sites where social interaction occurs. Because I had requested that students not identify individuals through their photographs, students often articulated the significance of their social world symbolically, contributing to an overlapping of photographic themes and corresponding meanings. I draw on the example of Eastend School, which was photographed widely among students, for its place as a landmark in the community, and for both the social setting and recreational opportunities that it provides. For example, students portrayed the school - an artefact of the "Built Environment" - as a "fun place," or a "second home" to spend time with friends and to "play sports." The fifth theme, "Family Farm/Pets," can be broadly categorized as those photographs that are representative of the importance of the ranching or farming lifestyle to students, such as their land, home, backyard, farming equipment, or animals.[31] The last photographic theme, "Prairie

[31] My use of the term "Family Farm" is not in specific reference to either one of a farm or a ranch, and thus the phrase is not intended to be mutually exclusive. Rather, my use of the term implies that a family farm may be a household, whose land may or may not be in production of agricultural goods, but which shares

Landscape/Natural Environment," includes those pictures and descriptions that depict the natural world - that is, both the landscape of which humans are a part and those areas unaltered by human action - as demonstrated through student's photographs of farmers' fields, reservoirs, geomorphologic features, coulees, rivers, trees, and sky.

5.3 Defining Students' Sense of Place

> "The Valley of the Hidden Secrets is where I grew up so that is home, it is place…You never know what you are going to find in Eastend...Up on the bench you never know!" (student particpant10b)

As described in Section 5.2.1, place is a product of students' daily activities, events and practices, social relations, and other socially constructed interpretations that are characterized by temporally and spatially bound references, and realized through their emotional experiences and cognitive outcomes. The ethnographic subtext of students' photographs and narratives describes cultural nuances of these rural young people, and lends insight into how their understanding of place is construed from their relationship with their surroundings – both experientially and socially. The meaning students conferred on their environment is not limited to conceptions of the landscape as a largely physical entity (disassociated from human interpretations), but is also a socio-cultural phenomenon that is constructed through social interaction, both shared collectively and experienced individually. Again, asking students to take photographs to define what "makes their place" was one way in which to take into account all forms of their interaction with the environment and each other, unveil these hidden and more symbolic meanings, and gain a more in-depth understanding of the significance of their experiences.

Although a comprehensive list of components constituting sense of place for students - including tangible place elements and cognitive dimensions - is located in Tables 5.0 and 5.1 respectively, for the purpose of this discussion I will narrow the frame of analysis to focus on those place meanings that are illustrative and representative of the many interpretations that constitute their sense of place, namely: their concept of home; their feelings and memories (as determinants of

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common characters of both a ranch and a farm, including the presence of an acreage, animals or livestock, and a history of, or potential for primary production.

place perception); locations or places they consider important; their cultural heritage and perceptions of the environment or prairie landscape; their sense of community; and their social relations.

Table 5.0. Tangible Elements Constituting Place.

Spatial	Practices/Events /Activities	Social Relations	Temporal	Other (social constructions)
▪ The Land ▪ Physical geography ▪ Environmental features (biotic/abiotic) ▪ Landmarks (built/natural) ▪ Locality ▪ Location ▪ Place of social gathering/ interaction ▪ Scale (i.e. small town dynamics) ▪ Space (personal/ physical) ▪ Home	▪ Livelihood ▪ Lifestyle (i.e. rural/ country life/farming/ ranching) ▪ Education ▪ Entertainment ▪ Recreation ▪ Volunteerism/ act of giving ▪ Routine ▪ Opportunities ▪ Hardship/ Adversity ▪ Tragedy ▪ Traditions ▪ Role modeling	▪ Family/familial dynamics ▪ Friends ▪ Gender relations ▪ Communication ▪ Accessibility ▪ Folklore/story-telling	▪ Childhood/ past ▪ Future ▪ Seasonality ▪ Historical aspects of place ▪ Relative novelty	▪ Nature ▪ Economic climate/cost of living ▪ Economic status ▪ Cultural heritage

Note: Not all of the above classifications can be easily grouped into a single category due to an overlapping of meanings, and thus some items could be placed in more than one category.

Table 5.1. Cognitive and Emotional Outcomes.

Cognitive Outcomes		Emotional Outcomes	
▪ Memories ▪ Familiarity/ Unfamiliarity ▪ Personal growth/ development ▪ Knowledge of a place ▪ Environmental awareness/ knowledge ▪ Skills/Competency (athletic, social, artistic, applied/technical) ▪ Inspiration ▪ Perceived utility ▪ Perceived limitations	▪ Recognition of relative longevity/mortality ▪ Ability to cope ▪ Ability to see with perspective ▪ Reconciliation ▪ Self-consciousness ▪ Value for environmental aesthetics (i.e. landscape, river, reservoir, Frenchman Valley) ▪ Acceptance ▪ Adaptability ▪ Sensitivity to gender stereotyping ▪ Recognition of difference	▪ Feeling** of well-being ▪ Feeling of comfort ▪ Feeling of safety ▪ Feeling of control/predictability ▪ Feeling of escape ▪ Feeling fortunate ("lucky") ▪ Feeling of support ▪ Feeling of privilege ▪ Feeling of companionship ▪ Feeling of Pride ▪ Enthusiasm/interest ▪ Hope ▪ Nostalgia ▪ Relaxation	Sense** of: ▪ Achievement* ▪ Accomplishment* ▪ Responsibility ▪ Mysticism/ fascination ▪ Freedom ▪ Belonging ▪ Independence ▪ Community ▪ Belonging ▪ Impermanence/ fragility ▪ Constancy ▪ Spatial isolation ▪ Ownership ▪ Order ▪ Security ▪ Appreciation/ gratitude (e.g. for country life, landscape, natural environment)

Note: Some classifications cannot be easily grouped into a single category due to an overlapping of meanings. Therefore, the boundaries between columns should be considered permeable.
* My use of the term "achievement" refers to students' sense of attainment of a specific goal or task, as recognised by others within their cultural setting. In comparison, "accomplishment" refers to their feelings of having attained an inner, or more personal goal.
** Although the terms "feeling" and "sense" are similar in meaning, I refer to "feeling" as students' intuitive sensitivity to a consciousness or state of being, and "sense" as the instinctive capacity to appreciate specific qualities of their lived experiences.

Students' interests in sports and recreation (such as ice hockey, curling, figure skating, golf, and the 4-H youth club), and their concern with their social activities, as well as a strong attachment to places that facilitate these pursuits, form the undercurrent of students' narratives and characterize their identity as youth growing up in a rural prairie town. These activities and the sites where they "spend most of [their] time," or "hang-out," are central to their daily lives. The focal point of these experiences were communicated as "encompass[ing] everything I do in my life," and was illustrated through statements such as "I spent, when I was younger, my entire life at the pool, and in the winter it was at the rink" (student participant 3a), or "the

rink is my life in the winter, and the loft…and the prairies…is my life all the time" (student participant 5b). Cognitive or emotional aspects, such as their memories of childhood, anticipation for the future, sense of freedom, sense of achievement and responsibility, as well as the desire for adult privileges, to name a few, also contributed to their lived experience. Similarly, some of their more personal struggles, such as interfamilial tensions, self-consciousness, sensitivity to gender relations, and the ability to cope with some of these challenges also influence how these students experience their place. Ultimately, their sense of place is comprised of "the stories," "good memories," "funny times" (student participant 5a), "the important things in life" (student participant 10b), and is further expressed as "I appreciate this," "it is what I do every day" (student participant 2b), it is "where I spend my time" (student participant 1b; 6b; 8b), and "it is home."

The latter - the concept of "home" - is strongly articulated as "a big part of place" (student participant 4a), encompassing a broader geographic interpretation in conjunction with more locally situated feelings of attachment, both of which comprise a "local structure of feeling" (Johnston *et al.* 2000, 583). Other researchers have also noted the importance of home as a focal point of meaning that serves as an emotional and physical reference (e.g. Sixsmith 1995; Tuan 1977). As illustrated in the comments below, the concept of "home" is used by students to describe an affinity for a larger geographic area (e.g. the home province, or Southwestern Saskatchewan) and the more immediate surroundings (such as the Town of Eastend, the family farm, their house, the backyard, or the local scenery), both of which engender feelings and memories tied to the land, the people, and other attributes with which a student identifies:

> Basically to me it's Saskatchewan and it's home. Place to me is really basically home…Home is the memories, the landscape, the pets and the people. (student participant 4b)
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> ~
>
> [The scenery] is what I have grown up knowing. This is familiar to me, it's my home, and basically home is place to put it simply. (student participant 4a)
>
> ~

"Home" as a place is both spatially defined and referenced, invoking particular sentiments and eliciting memories. One student perceives place as directional - a demarcated boundary into which she enters or from where she departs:

> This is actually the road turning into my yard, right there. And I just wanted to take a picture of my driveway because to me its always coming home...No matter what, like even sure it's the road going out of home too, but it means more coming home to me. Plus it always reminds me that mom never forgets to say "we're back" when we drive into the yard. She does it every time. (student participant 4b)
>
> ~

Memories, as a cognitive outcome of students' lived experiences, are also central to their sense of place. Students describe memories in reference to particular people, events, experiences, locations, or time periods. Memories are often reminiscent of their childhood, or "growing up."[32] For one student, the meaning of the school playground relates to all the "little things" that happened there during her childhood, and for another, place constitutes the memories of a particular time and experience that "brings back the surroundings":

> …it just reminds me how we used to play...I made most of my friends on the playground...It represents just memories, like little things…and it just reminds me of stuff like that. Every time I think of the playground I think of all the recesses I was there. (student participant 2b)
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> ~
>
> But, basically I sing country and that's what I like. I also like other music but country is one of my favourites... And this [picture], he is a Christian singer, and [Catherine Smith], my cousin, actually plays the piano and I sing to this song, and its really really cool and she's a really good piano player... I think it brings back the surroundings, like when she stays over we always go on the piano and stuff, so that's kind of cool. (student participant 2b)
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> ~

As alluded to earlier, memories of people, past events, or other life experiences are often connected symbolically to places of significance, and in this way these reminders help to define students' sense of place. For one student, this association surfaces in a sign of the Valley of Hope Lutheran Church, which is symbolic of a grandmother that had recently passed away, described as "someone that had a big impact in my life" (student participant 10a).

In this way, features of the built environment serve as landmarks within the community. These features have meaning for students because they are also "social

[32] Because of the young age of student participants, their references to the past always correspond to the period of time that I refer to as "childhood."

gathering kind[s] of place[s]" (student participant 3a), "hang-outs," or places "where a lot of things happen" (student participant 1a), such as the Cypress Hotel, Jack's Café, the Eastend Co-op, the dam, or community facilities such as "the rink," the swimming pool, and the school. These sites of significance also surface as more personal landmarks, identified by students (in their own words) as "places where I work and my family works," or as "places that just give me a lot of memories of the past or of the future," and in the latter case, spaces that help to create aspirations or feelings of hope (student participant 3b). Among these places where students "spend a lot of time," they recognize the school as being particularly important - a "big part of the community," socially, recreationally, and educationally (student participant 1b). Students widely acknowledged the central role of the school to their social world, describing it as a good place to "meet new people…make new friends…[and to be] part of the community" (student participant 1b). Students were also forthright in highlighting the educational value of the school, which was reflected in their own words as a place that "builds me for the future" (student participant 8b) and that "represents a good education on to a future" (student participant 9b).

Figure 5.2: Eastend School in the Fall (student participant 1b).

> It's where I spend most of my year, I guess, most of my time. Meet new people there, make new friends there and that's where I learn...That's how I get knowledge and intelligence and stuff like that. (see Figure 5.2 above: student participant 1b)

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The school is described by students as their "second home"; for them it is a place where they can escape from family problems, or where they can "always feel safe."

Students feel pride for their school and appreciate the sense of community that exists because it is "more personal" and "friendly" – a place where "you know everyone better and they know you better" (student participant 9b), and where "teachers learn more about who we are" (student participant 10b).

> I love my school... It's just so friendly. Teachers are not just your teachers. I don't know how to describe it, but I guess like, they are not just there to show you the book and read it…They are actually there. (student participant10b)

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For student participants, the T-Rex Centre "represents Eastend," and thus forms a particularly important part of the identity of their town. The museum's relative novelty within the local community and the interest it has spawned in the region "as something Eastend is famous for" has contributed to the sense of deep pride students feel for their place (student participant 9a). In addition, these sentiments have been re-enforced by what outsiders value in the community, or by how other people view their place, and yet at the same time, students' connection to this new icon is based on a foundation of more personal experiences - it is a place with educational significance, where students work in the summer, and where they get together socially for Friday night movies.

Figure 5.3: The T-Rex Discovery Centre in Eastend (student participant 7b).

> The T-Rex Centre…There is a big documentary on this stuff, like what's happened since they found Scotty. It's pretty sweet …We just got [the Centre]. We just had our grand opening last summer, it's fairly new. It kind of shows

> Eastend isn't just some stupid town that doesn't have anything. Like, we've got most of Scotty the T-Rex and it's a pretty cool place and I like – it's really interesting, I am really into all that stuff…Just last year I was talking to some employees that I worked with over the summer, and they said they had at least a hundred a day...I didn't know there was that much interest, that there was actually that much stuff they could show you and teach you about it…I am proud to live in the prairies. (see Figure 5.3 above: student participant 7b)
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> ~
>
> …that's really what our town is famous for – is the museum...on Fridays they show a movie there. That's really the greatest attachment to the museum for me...We usually go every week once school starts again...(student participant 8a)
>
> ~
>
> I love palaeontology and I love to just go out and look around in the dirt...Just go out there and look around and look at rocks...I found some Indian things out at the [Southfront?] quarry and I found bronothere bones....We had this Canadian Geographic Kids or something come to the museum, and Tim Tokaryk who is the head palaeontologist there had asked if I could come and help with it. And I thought that, you know I would just be carrying equipment or something. And I had to stand there and work with stuff and be on camera...We had to put a caste on a toe bone of a raptor and flip it over and make sure that the bone didn't break when you flip it over…you go way down the valley there, and there's the white mud pits where you can find a whole bunch of pre-Cambrian things. (student participant 5a)
>
> ~

Certain landmarks within Eastend have become part of the local landscape and engrained in the cultural identity of the town; the Eastend grain elevator is one such icon that students have identified as being highly familiar, clearly demarcating the boundaries of Eastend as home.

Figure 5.4: The Eastend Grain Elevator (student participant 10a).

> …it is actually in our community – not everybody has one, and [it's] history….I would be all right if they shut down. I don't know its – if they shut it down you know, whatever, it doesn't affect me. But, if they bulldozed it that would be different…If I didn't see it there, it would just be completely different. It wouldn't be like my hometown. It would look like somebody else's hometown...Like when you drive down the hill from out that way. I don't know. Like you know when you come off the highway from Consul, and you drive down that big hill from the graveyard, and you see this big orange building - and that just shows that you're home! (see Figure 5.4 above: student participant 10a)
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These same landmarks, perhaps ironically, also signify a wide-reaching transformation that threatens the very constancy and familiarity of students' existing conceptions of place. In describing how "the little wheat pools in little towns got shut down," students demonstrate that rural change has become accepted as part of their everyday life - a depiction of their community as relatively small in scale, within the larger demographic and economic context (student participant 3a).

> And also the history, like the pioneer place …it's not going to stay there forever, so that's place to me...Just because it's going to be history someday, and I know that I have lived it....they've already taken out the train tracks. Basically, there's still some but not very much, so I am pretty sure it won't be there forever. It won't stand that long, plus they'll probably shut it down...by the time two - thousand whatever comes up, they'll have more technology, or everybody will have to take their stuff to Gull Lake or somewhere where they have a bigger one or something...(student participant 10a)
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> ~

The importance of farming and ranching to the livelihood of their community is reflected in how students identify with their surroundings, and represents the intersection of environment and economy with the culture of the place. As illustrated in the statement "…our steers, or cattle...its how we, I guess, make our money...well, not now," students speak to the underlying financial struggles that currently characterize the economic climate in the agricultural industry (student participant 1a). However, most predominantly, when speaking about their family farm, students demonstrated a keen awareness of the history of the land, which in many cases, has been in their families for generations, and to which they often refer as "the homestead" - this is a place where historical, cultural, and symbolic attachments to the land also come together. Their symbolic representations of heritage are connected to a sense of pride and ownership for the land, and feelings of kinship with family, together with the knowledge of the physical geography of the place. They show a deep fascination and appreciation for the temporal longevity of the land, which is juxtaposed against finite social constructions of place, and even recognize human mortality within this context. They measure their own age by the growth of the trees planted by their grandparents on the family farm, the rock up on the hill under which their grandparents' ashes were spread "upon the homestead," or the old wooden plough that was once used to break the land and which has been in the family for generations.

Figure 5.5: A rock on the homestead (student participant 8b).

> This seems kind of silly because it is just a rock...Well it is kind of my place, the homestead place of where I live. It is what represents the homestead...seeing as how we still own that land...it's kind of my heritage and a little bit of my grandparents, but [the photograph] was meant to be of the homestead…It does symbolize where my grandma and grandpa were [buried], and the hill above the homestead…It's kind of neat to see people, how they used to live and that kind of thing, and actually have that on your land and know that we used to own it…It is easy to take for granted I guess…I feel old…It's memorable, I don't know…The activities that took part there that you never really got to see but it was there. (see Figure 5.5 above: student participant 8b)

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The significance they attribute to their surroundings not only relates to the agricultural history of the region, but also to their memories of childhood growing up on the farm. In addition, embedded in their strong attachment towards the land is a knowledge of the local environment. Student participants in Eastend feel that they "know this land." They demonstrate this knowledge in their descriptions of the local geography of the Frenchman River Valley, and its "ecosystem" of pelicans, beavers, muskrats, and "hills of flowers," as well as in pointing out the best times for swimming at the dam, where to collect freshwater from the springs, or where the fireflies can best be seen at night.

Figure 5.6: "The bench," near Eastend (student participant 8a).

> Have you ever heard of the bench?...It's like a great big hill that you go up and there's like a great big flatland, and I live up there and it's like the windiest place ever, but we've got this one little coulee and it's not very windy down there at all…it's kind of like a pond area there... I lived my summer down there because we don't get to go anywhere for camping, cause its bailing and haying and stuff, so that's pretty much my camping...I love how, you know, you can come across this creek and it will be kind of windy, but you can walk in there and there won't be a breath of wind…And there are fireflies down there...And if you walk onto this hummock sometimes you can find birds' nests and stuff, and actually right by those trees there is another spring…[Fireflies], they're bugs that light up when they are flying around…It depends what kind of night it is really...You have to sit there for a while and they'll start coming out around you…there is never any mosquitoes down there. It's phenomenal...(see Figure 5.6 above: Student Participant 8a).

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Identified in photographs of coulees, creeks, and open plains, student participants describe their connection to the physical landscape in their own words: as "the scenery that is kind of burned into my head" (student participant 5b); " I've known this place since I was born. I love it. I think it's so pretty. It's just pretty much the coulee of the bench" (student participant 8a); "It's part of me, I grew up swimming in a creek" (student participant 8a); and "These trees have been here since the farm was built. They are part of my place" (student participant 4b). This relationship with the prairie landscape is characterized by a deep-rooted appreciation for what is familiar, often identified as what they have "grown up knowing," including the "wide-open sky," "the prairie," "the crop[s] growing," "the bales," "the cattle,"

"the quonset," or as described by one student, "something I see every time I step out of my door" (student participant 4b), something that "never changes" and is "very familiar." For students, this is the land with which they identify as constituting their place – this is home:

Figure 5.7: Saskatchewan sky and hay bales (student participant 4b).

> ...to me it's Saskatchewan plain and simple. Because it has the bales and basically the wide-open sky. But I thought it looked really neat...it's always there! In Saskatchewan, literally there is nothing to obstruct your view of it. (see Figure 5.7 above: student participant 4b)
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Students describe their feelings of attachment for the landscape as "the[ir] heritage, the homeland…the fact that you can see forever, how it is just so open...free…peaceful" (student participant 8b). Another student emphasizes her attachment to this land that formed, in her words, "a chunk of my younger life" (student participant 2a). These memories that she describes as "kind of dy[ing] hard" are elucidated in comparisons that she draws between life "on the ranch" and life "in town," conveying that lifestyle is an important part of students' sense of place.

> In town you don't really have very much freedom because there is always cars and everybody is going everywhere, and on the ranch, or out of town, everything is taken at a slow pace, and I don't know, it makes me feel more free…I think it symbolizes how I've moved on, maybe. Because [on] my ranch, we had a really big house. There was cows and we had

> animals, and then we moved into Eastend and we have, I don't know, a medium-sized house with flowers instead of animals. So, its kind of how we have changed...it's a different lifestyle – it's definitely really comfortable if you get adapted to it pretty easily. And the shade is nice because we are surrounded by trees and you don't always like the sun in your face...there's always different things that set you aside. Like, I have horses and I can really ride them a lot on the farm, but there's not as much in town. (student participant 2a)

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The importance of the land to students is also entrenched in the local history and folklore of both the natural and built environment, as well as in their family traditions that are connected to their surroundings. Students refer to the floods of 1954 (in stories passed on by friends and relatives) and 1996; the rebuilding of the Eastend dam; anecdotes of the swimming pool "falling into the river" (student participant 10b); the white mud clay of Jones' Peak; the historic trail of the Northwest Mounted Police, which traverses students' own land as it stretches from Wood Mountain to Fort Walsh; and collecting pussy willows in the spring, as one student recalls in the statement below:

> It's kind of a tradition…Every Easter it was kind of a family thing that we would go out and we would gather all these pussy willows and take them off. They come huge some years. Plumb full...It is kind of the tradition and memories...Just family I guess because we go out and we pick them on Easter Day...We cut them up and Auntie will take some home and we keep some. (student participant 8b)

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The importance of community also surfaced throughout student interviews. A common thread within students' discussions was the significance of social relations and cohesion within the community. Students describe the town as being small, "community-wise"; they refer to the "small town kind of thing" where "everybody knows everybody." Community centres such as the school and the Eastend Recreation Centre serve as places where families, friends, and neighbours come together. Students acknowledge the importance of people's roles (often overlapping) within the town, and recognize how their cumulative contributions and efforts are central to the community's capacity to carry out sporting activities and other local functions.

> …my sports are there, my friends are always there, family's there...because there are so many memories. (student participant 10b)
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> ~
>
> Curling is another sport of mine. And like [Janice] and [James] are the caretakers and they are kind of related, but not really because they are a long ways. They are always working so hard, it's kind of nice. Not many people would put that much dedication into it. They are there every night...Always sweeping and mopping the floor...(student participant 10b)
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> ~

While I was carrying out interviews with student participants, a large, well-known family within the community had a house fire and lost everything. This event triggered an overwhelming generosity from the local community. Neighbours, friends, and community members went to the farm site with their trucks and hoses to help the local volunteer fire department, and within hours, the community had responded, lending their support. One student noted this demonstration of *community*, as it manifested in the classroom.

> …they did not have a choice about their house, so the teachers are more lenient towards them. They don't have all their books, some of their books probably did burn. Or say, you had a family issue or something and you didn't get your work done, they are not going to dock you marks, because they know things come up... More supportive than like Swift Current or the Hat [referring to Medicine Hat]– no offence to them. (student participant 10b)
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> ~

For students in Eastend, rural depopulation sets the backdrop for their experiences and how they view their community. Students recognize the limitations that exist by living in a small rural town, often drawing comparisons to larger centres in reference to what social and recreational opportunities are available to them. Depicted through a photograph of a classroom of desks, one student described this "empty picture" as "symbol[ic] of the declining population of the school" (student participant 9b). Socially as well, a sparse rural population forms part of students' daily reality. Within this rural context, people and the social relationships they produce play a particularly significant part of place identity for students.

> It's too bad you can't see all the way down the valley to Ravenscraig...Well because the [Jones'] live out there and

> [George] lives out there and [Sandy] lives out there and it's like in the middle of nowhere. It used to actually be a town, but right now it's the [Jones'] and maybe two or three families of [Smiths], so it's like [Jonesville]. That's all we call it. It would be cool if we could see all the way down the valley to that because little people as there is there, it's pretty much all we hang out with. (student participant 5b)
>
> ~

On a more individual level, students sense of place is further defined by spaces (such as their bedroom, backyard, or their school) and objects (such as a music collection or a fishbowl) in their environment that enable them to cope with social challenges that they face in their daily lives as teenagers.

Figure 5.8: A fishbowl (student participant 2a).

> I got [the fish bowl] just before school started and its kind of like whenever if I am mad or something or I am not feeling really upbeat they are really calm and peaceful because they don't jump around. They just swim and I feel better. (see Figure 5.8 above: student participant 2a)
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> ~
>
> [The backyard and hammock] - it's simple but its got meaning to it because it calms me down and it makes me feel better. (student participant 2a)
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In the fall of 2005, students returned to Eastend School without one of their friends, and for one student participant, without a brother. The previous spring, a student from the school was in a serious car accident, which left him in a coma. This tragic event had a profound influence in their daily lives, emerging in many interviews as a ubiquitous agent in what students defined as being important to them.

A student described the accident as "…something that happened that had an impact on my life and my friends and my families and everything" (student participant 3b). For this student participant, the absence of a younger brother has redefined existing notions of place, displacing all at once the associations that she has with particular sites and activities, and her social world.

Figure 5.9: The road and the site of the accident (student participant 3a).

> …that's just like the main road that goes into Eastend, and over the railroad tracks there...I think of my brother and I think of a lot of the times that we used to hang out there and stuff. Like during the summer we hung out there quite a bit because it was really nice. We would just go out and hang out, there was just a few of us, our friends. It just reminds me of a lot of memories cause we had some fun up there...(see Figure 5.9 above: student participant 3a)
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>
> …last year [he] and I were badminton partners and we were a really good team. Like, we beat every team that was on the junior team, like all the doubles teams, whether it was boys and girls or just girls and just boys. And then the Saturday before badminton units [he] got into his accident so I just, yah, I don't know. I really liked badminton, and him and I were a really good pair. (student participant 3b)
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> ~
>
> It is just meaningful because [he] was my brother, and he was a really big part of my life. Cause, we were best friends and my little brother also. (student participant 3a)
>
> ~
>
> I think of the future, mostly. (student participant 3a)
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Within a small community, it is evident that an accident of this nature had far reaching impacts. As illustrated in the statements above, the accident brought into view the importance of memories of the past and previous experiences for this individual, while also underscoring the significance of family, friends, or social relations, to what one student refers to as "mak[ing] my place." In effect, both social relations and personal experience are invariable components of student descriptions of place, whether speaking to events within their community, their agricultural background, or their ties to the prairie landscape and each other. The ecological monitoring program was able to have an impact on students by building on many of the same aspects of place that they regard as important to their daily lives, both past and present, as young people living in a rural community.

5.4 Conclusions: The Impact of the Ecological Monitoring Program

"To experience is to learn" (Tuan 1977, 9).

Students spoke of meanings inherent to the concept of home or backyard, as a place of familiarity, memories, where time is spent with friends and family, and to which students ultimately feel attachment. Students also made reference to a sense of ownership and pride over the environment through words such as "our creek," "our land," or "my landscape," and yet, as suggested earlier, the river has existed largely unnoticed for students, not as it might appear to someone who has truly taken the time to experience it and reflects upon its significance. Students' statements, such as "I've never been at this particular site" (field notes), or "I never really knew that the Frenchman River could be that deep" (student participant 4b), suggest that visiting and working with the river presented opportunities for direct engagement, and subsequently environmental learning. This program, through locally-focused, experiential activities helped to personalize the river for students, bringing it, metaphorically, into their backyard. This observation is further supported by Walck (2003, 207), who maintains that "when land is local, bounded, and personal, it becomes place." For student participants in Eastend, these boundaries of home have been extended to encompass a broader understanding and appreciation for their environment, ranging from a more intimate knowledge of the meanders and depth of

the river channel, to the biological diversity it supports – not simply a place that they enjoy swimming or boating in the summer, or a place from where their cattle drink.

For students, their history is "completely Saskatchewan," and subsequently they demonstrated that what is local is meaningful because of entrenched feelings of familiarity, ownership, and connection to their cultural past. For these reasons, students expressed an interest in gaining knowledge about what is local to them, and it follows from here that the local focus of students' learning experience was important to how the program impacted them.

> I rather learn about my home and my surroundings…Like, you learn about your ancestors, about how Eastend used to be…I think if you live in Saskatchewan, you should learn Saskatchewan history because that's where you grew up, so I think you should learn, you should know your own history first...Whereas Alberta, well, that's Alberta...I like Saskatchewan…My history is completely Saskatchewan... (student participant 10a)

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As discussed in Section 5.2.1, place meanings change with the addition or layering of new experiences, and the monitoring program served as one more of those experiences from which memories and meaning are created. Greider and Garkovich (1994, 5) propose that "every river is more than just one river," and that "every rock is more than just one rock," but rather that place is socially constructed, mediated symbolically through our day to day experiences with the natural world, including interaction with each other. The tragedy that impacted the local community (referred to in Section 5.3), surfaced in many of the interviews and symbolically in photographs, demonstrating among other things the fragility and impermanence of place meanings. Coincidentally, one of the monitoring sites was also the very site of the accident, and despite this, the student concerned commented that she hadn't laughed as much as she did on her field trip since her brother's accident. Many students also demonstrated, in their own words, the importance of this particular event in the building of place identity.

> I really would have liked to take a picture of the sign that [he] crashed into. Because they still haven't fixed it, it's still just half the sign there, so it would have been kind of nice to take the picture of that…Right beside the water treatment plant. That sign right in front there, it's only half the sign and you

> might not have noticed, but that's where [he] came through. You can see the skid marks…it would have been nice to take that picture, but I guess I'll just take it with a normal camera sometime. (student participant 5b)
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>
> Do you know where the old tower is up south, we call it south hill.…there is a sign that is there and it is still broken from when he rolled into it. And ever since [his] accident we'll sometimes go up there and we hang out there or something when there is nothing to do…(student participant 3a)
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Place meanings are not static, but rather in a constant state of flux, and in this way, sense of place exists on a constantly shifting terrain of meaning and identity – an observed outcome of what Leyshon (2002) describes in his work with rural youth as a heterogeneity of knowledges and experiences of places. Proshansky *et al.* (1995) suggests further that these adjustments occur either slowly over time, or rapidly, triggered by a specific event. Participants' associations with the site may have changed three times over: before the tragedy, after the tragedy, and following the monitoring program. The project activities contributed to the archive of students' experiences at the water treatment plant, not removing or negating the existing values and memories connected to the site, but rather adding to these meanings, and providing another lens through which students could *see* this particular place and experience it. In other words, sense of place is tenuous; both the community tragedy and the ecological monitoring program precipitated changes in the way this place was perceived by students.

The nature of experiential learning was illustrated through students' characterization of their experiences in the river as "play" and "fun" (as described earlier in Section 4.2), corresponding to what Proshansky *et al.* (1995, 94) would refer to as the river serving as a "play area." Learning occurs when one builds associations with locations in a playful way, and it is from these "space-related cognitions" that place identity is born (Proshansky *et al.* 1995, 94). As shown in Figure 5.0 (Section 5.2.1), sensory vehicles are important characteristics of the experiential process. Students use all senses to attribute meaning to a place; the identity of the region (or their attachment to it) is the outcome of something observed, felt, heard, experienced, remembered, and ultimately appreciated - a range of sensory experiences that students describe, as

the anticipated greetings of the farm dog when coming home, or the recognizable smells of the ranch, the memories of riding in the hills and playing in the coulees, and the feeling of wind up on the bench, or as expressed by one student, it is simply "the sun on my face." Ryden (1993) considers how we interpret and become familiar with places, and, in so doing, describes the sensation of feeling every bump in the ground; he talks of the familiar as analogous to an expected bump in the driveway when returning home. Similarly, students described their backyards as something familiar, or as a place that they "know very well" – an awareness that is characterized by their recognition of details, such as a dog food pail tipped over in the yard and out of its regular place. The pail in this case, signifies a small landmark that Berry (in Ryden 1993) identifies as a sign by which someone truly knows their place and themselves. Here, I extend the understanding of this interplay between experience and meaning to consider that as an outcome of experiential learning, the local river became more personal and familiar to students, like their backyard; a way of intimately knowing their surroundings, which differs from their previous descriptions of the river as a "taken for granted" feature of the landscape (refer to Section 4.3.2). The monitoring program gave rise to students' active recognition of their place and the partiality of their own views of their environment, in contrast to the passive act of observation previously encountered by students. As demonstrated in the comment below, this active observation, or awakening of the senses, which arose from their experiences participating in the program and from taking the time to contemplate what is important to them, surfaced as an appreciation for the aesthetic value of the landscape and the place from where they come:

> *Researcher*: Now, how did the ecological monitoring program affect how you feel about your place, about the community, this region, Eastend?
> *Student participant*: I appreciate it a lot more, and actually usually when I look out the bus I look out the window but I am not really looking at what's there, like I'm just kind of gone, just completely gone. But now I will look out and I'll sit there and think I wish I had my camera! Like, there was one time, I so wish I had my camera that day…it was on the bus. We were on the way to school. We were just on the highway, just south out of town and that hill coming down into town, we were just approaching it. A cloud had just filled the valley, overflowing almost like it was cotton and it

> was like this big – you could see the perfect blue sky above it, but just the hills, there's two hills on either side of the highway before it goes down a hill, and it was filled up to the brim but it wasn't coming down the highway towards us. It was just sitting there in the valley. It looked so cool! But it never happened again…(student participant 4b)
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Kruger (2001, 178) highlights that the meanings of places are more than simply aesthetic to the observer, they are also central to human experience, emphasizing that we value places not simply because of what we can derive from them, but rather, for how we define ourselves in relation to them – as discussed earlier, this is place identity, a basis of our sense of place. Students were able to get to know their place through a different lens; they had the opportunity to observe their surroundings from the vantage point of an "outsider," or as articulated by one student below, "the way that someone who came to Saskatchewan and had never been here, how they see it."

> In this picture it's kind of to show how the prairie is so flat. Actually even before this photo project, most people that actually live in Saskatchewan kind of think of it kind of plain, because this is what they see every day, but then I took that picture and I realized that, I kind of got to see it from a different perspective, the way that people that come to it – come to Saskatchewan and have never been here – how they see it…Most of the time they're from a place – you can't see as far, you can't see the whole land there so it's kind of a treat for them to see as far as you can see… For us here it's just kind of plain, and we don't take the time to look at it because it is all around. (student participant 4b)
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Again, student agency was central in this cognitive transformation. Participatory and experiential learning acted on students' identity by reinforcing what had always been familiar to them - including their ties to their heritage and the prairie landscape, among many other aspects that constituted their lived experience in Eastend - but that they had never fully appreciated. In this way, learning was not only characterized by the acquisition of knowledge about their river and the environment more broadly, but also included knowledge that was gained informally about the place in which they live, while strengthening their understanding of

themselves as part of their place - a sense of place which is still being developed by them. As one teacher participant points out below:

> I think [the project] definitely contributed to their sense of place. I believe it contributes to the students' individual identity, who they are, where they come from. They may not realize it now…but I do believe that when they go away from here or they are done school, or for whatever reason leave Eastend, when they return it will be more powerful to them. And I think also when they do move away and when they are asked "Where are you from?" that their mind will go back to Eastend and the river, and that will be part of who they are. (teacher participant EE)

~

Although the purpose of this research is not to examine contributions of these acquired meanings that I have identified throughout this chapter to students' future commitments to stewardship, it is important to consider other research that suggests that it is this kind of learning, or the rediscovery of place, which underpins movements towards achieving sustainability (e.g. Kruger 2001). Based on insights from student interviews, I suggest that transformative learning represents the theoretical bridge between contributions of students' participation in the ecological monitoring program to the development of new attitudes and behaviours (i.e. through the process of meaning construction that I have presented in Section 5.2.1, see Figure 5.0), and ultimately practices of stewardship. I propose that there are two components of transformative learning that are at work cyclically here: the internalized and the realized – a feedback loop that involves a connection between the development of attitudes and volition that translate into an action and an outcome, which in turn can affect attitudes (see Figure 5.10 below). This understanding can be applied to students' relationship with their surroundings and attitudes to the river or local environment, as well as carrying the potential to be realized into the practice of stewardship, as an outcome.

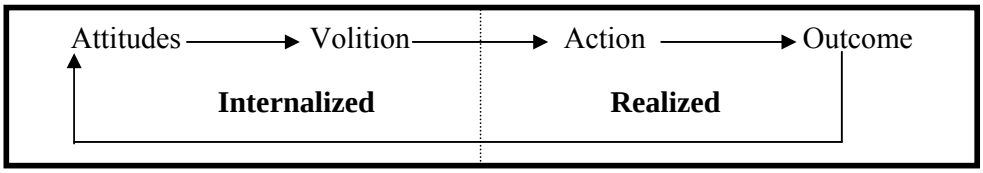

Figure 5.10: A proposed cycle of transformative learning (Source: Author's conceptualization).

Again, it is important to note that my intent in this thesis is to reveal what meanings students derived from participating in an ecological monitoring program based on: first, an understanding of how these meanings are formed for students (a process which is shown earlier in Figure 5.0); and second, an understanding of those internalized aspects of the transformative learning process, or students' attitudes of like or dislike and feelings of attachment towards their environment and region (i.e. sense of place). My objective, however, is not to evaluate how these learning outcomes may be realized in the form of future actions or behaviours (see Figure 5.10). In the following Chapter, I attempt to shed light on this issue by acknowledging the tensions that may exist between an existing cultural identity and newly acquired environmental learning outcomes and meanings. I explore the possibility that sense of place may have further, and much more complex implications for future commitments to stewardship than I originally anticipated, and possibly as independent of environmental awareness.

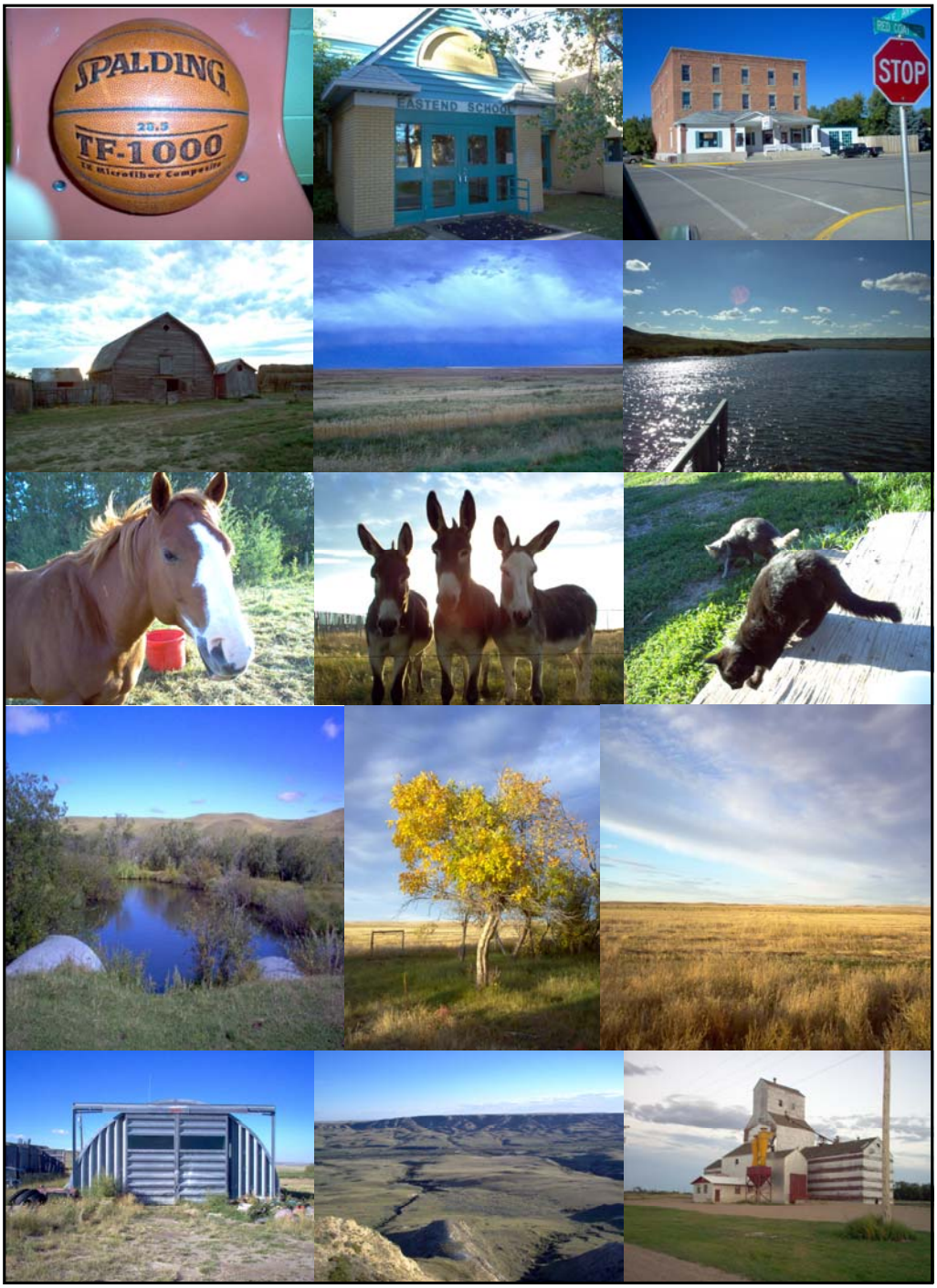

Plate 4: A selection of students' photographs portray the variety of elements that define their place, growing up in Eastend.

CHAPTER 6: CONCLUSIONS

> "Learning transforms our identities….transform[ing] our ability to participate in the world by changing all at once who we are, our practices, our communities." (Wenger 1999, 227)

6.1 Summary of Findings

This research stemmed from a need to understand how engaging in a stewardship project could influence rural young people's environmental learning outcomes, as well as the meanings they derive about their place, from their experience and participation as members within a learning community. Four questions guided the research: how participation in an ecological monitoring program could build upon students' awareness of their environment; what meanings students could acquire as a result of this participation; what role a learning community could play in the facilitation of this project and the various forms of knowledge students acquired; and finally, how these experiences could influence their place perceptions.

It is challenging to address these questions individually. The complexity and interconnectivity among the many variables that influence students' perceptions of the place in which they live make it difficult to reduce these meanings and their mechanics into simple terms without over-processing and over-compartmentalizing them. Despite this difficulty, several conclusions can be drawn. This project created a symbolic space, which engendered knowledge exchange and new meanings between young people and adults. Participating in the ecological monitoring program as members of a larger learning community elicited feelings of belonging, a sense of privilege, as well as a sense of responsibility and achievement. Students felt empowered, and believed that their work would make a difference in, and a significant contribution to, their community.

Students also began to appreciate the place from where they come, and expressed in their words, that "Eastend actually isn't in the middle of nowhere" (student participant 3b). On the contrary, for students, Eastend was perceived as

being somewhere: a place from where people representing universities and museums could learn about biological diversity and water quality, and also a place in which these outsiders demonstrated an ethic of care for environmental quality. Creating experiences with the river through ecological monitoring contributed to the memories and meanings by which students define their place and themselves – with the river being central to their conception of place as home. The river, previously described as a taken-for-granted feature of the familiar landscape and largely associated with its agricultural importance, was re-negotiated and re-defined as a social space, a place of play, learning, and biological significance. In this way, participatory and experiential environmental learning emerged as the knowledge students' gained about biological diversity, water quality, local variation of ecosystems within the Frenchman River, and applied skills for ecological monitoring. This learning also involved deeper individual meanings arising from students' direct engagement with the river and each other.[33] To this end, this research also challenges common misconceptions that environmental awareness is limited to measurable learning outcomes, and rather, advances an alternative view of environmental learning, which includes meanings that also form the basis of sense of place.

In effect, a central theme in this research includes the dynamics of "inside-outside" relations – relationships that exist between participants within the monitoring project, and those occurring between participants and their surroundings, which are marked by *inner* social-psychological dimensions and *outside* places. Understanding both of these sets of relationships required first recognizing how meanings were created for students, thereby helping to elucidate the way in which student participation in the ecological monitoring program entered that process of meaning construction. In so doing, this thesis makes an important contribution to understanding how sense of place is formed and nurtured for rural young people, which I identify as an interaction among three central components: the first, the tangible elements constituting place (their "outside place"); the second, their lived experiences; and third, their cognitive and emotional outcomes (their "inside place")

[33] It is important to emphasize that because experiential learning for individuals unfolded in the social context of participation within the project, the lines between experiential learning and participatory learning cannot be easily drawn. In this thesis, PEEL may therefore be thought of holistically, with the view that knowledge and meanings gained were grounded in an inherently social experience.

that arise from those experiences. Students define their place by the people with whom they interact, locations where they spend their time, and the symbolic meanings or associations that are connected to those things, or people, places, and activities.

Students' photographs and narratives revealed meanings that were both collectively shared and individually held. Common to all students were the importance of social relations and sites that facilitated social interaction. This observation was readily apparent in my communication with students before the program, and was perhaps even more clearly conveyed during post-program interviews. The monitoring project facilitated participatory learning – a process of learning through social inclusion and interaction – by creating the social space that is required to construct collective meanings, tying students to one another and other project participants in the formation of new meanings. Students also acquired meanings that were construed from personal experience and individual subjective interpretation, grounded in the more experiential aspects of their engagement.

Place meanings emerged in my data as being deeply rooted in students' identity. The process of meaning construction that I describe in Section 5.2.1, was in part, developed out of the necessity to determine how students define what is important to them, and account for the rural context in which their experiences unfolded. Other researchers and theorists have suggested that people's attachment to, and appreciation for places precedes any commitments to stewardship, and ultimately goals for sustainability (e.g. Sancar 1994; Stedman 2002; Walck 2003). This claim may largely depend on understanding how place identity is constructed for individuals and the setting in which their lives are enacted. Contemplating students' rural identity helped me to contextualize their experiences, and to recognize how the monitoring program complemented and built upon an identity that was defined by social relationships, a strong sense of community, the importance of the school as a centre for learning and opportunity, and an entrenched connection to the land and their heritage. These meanings existed amid a backdrop of rural depopulation and relative isolation, which one could argue leaves participants within these communities particularly impressionable to outside interest in their local communities.

The role of a learning community in facilitating the acquisition of knowledge included three primary functions. First, it provided the social and

structural support, ranging from equipment and expertise, to logistical guidance required to build local capacity for ecological monitoring as a viable avenue for environmental education within a high-school curriculum. Second, the partnership among students, teachers, community members, and researchers enabled the transfer of information through a hierarchy of individuals and agencies – a process that was inherently about defining boundaries within communities, between communities, and across socio-cultural divides. Carrying out the monitoring program required working within the conditions and expectations of local people. This meant adapting how ecological information would be shared and enabling local participants to have greater control over the nature of their relationship within the FRBP. These boundaries also demarcated differences in perspective or "ways of seeing" among members of this learning community, again, signalled within this research by insider-outsider relationships. The context of difference, or tensions between the familiar and unfamiliar described above also alludes to the third function of the learning community - as a source of symbolic significance for student participants. Students demonstrated that learning about the Frenchman River together with other researchers and community members, contributed to a greater appreciation for, and attachment to their community, their region, and their river. Even the process of conducting this research (through collaborative, knowledge-building methods that engaged participants in self-reflection) was a significant factor in the evolution of their perceptions of the place in which they live – a finding upon which I expand further in Section 6.2.2.

However, despite the pronounced influence of these acquired meanings and knowledge on sense of place, some student participants maintained deep-seated attitudes of complacency about water quality, as well as a utilitarian view of the river with respect to ranching practices, raising questions as to whether environmental awareness and sense of place are truly mutually reinforcing. Student photographs and interviews revealed that their agricultural heritage and way of life are acutely embedded in their sense of place, suggesting that regardless of environmental learning, these cultural values remain important influencing factors in how they perceive of, and attribute meaning to, their physical environment. Place identity or sense of place - in this case associated with a rural, agricultural context - may therefore represent barriers to transformative learning. Similar observations are also noted by Wakefield *et al.* (2001, 175), who, in examining the role of place

attachment in decisions to take civic action around environmental air quality, propose that local perceptions and subjectivity are important factors in prompting concern and action around environmental issues. Samuelson *et al.* (2003) also comment that identity is likely the mediating force between knowledge and action. This research makes a start in this direction of enquiry, elucidating the role of existing conceptions of place (i.e. place identity) in influencing what one takes away from their experience as a participant in an environmental education program or stewardship project by identifying the importance of factors such as human interaction with each other and their environment, community values, and local industry, as they apply to the rural setting. Interestingly, Wakefield *et al.* (2001, 175) found that feelings of attachment were "necessary," however not "sufficient," conditions for environmental action, suggesting that social capital may be a larger mobilizing force than place identity or attachment in the formation of new attitudes and behaviours. Forming learning communities is therefore an essential catalyst for social interaction, recruiting individuals (particularly young people), supplying them with the resources, and possibly sustaining individual commitments to stewardship.

Other researchers have also questioned the correlation between attitudes and behaviour, recommending that this examination be reframed to consider "under what conditions attitudes may predict behaviour" (Stedman 2002, 566). In light of the environmental complacency observed among some participants in this research, the social, structural, and symbolic space created by a learning community may be particularly critical. Because my own work was limited to examining a learning community in its early stages of development, follow-up research in Val Marie and Eastend would be required to see how it evolves and whether it functions independently to engage local people (including schools) and to perpetuate ecological monitoring and information sharing in the midst of this dynamic rural context.[34]

[34] As of May 2006, other organizations such as Nature Saskatchewan and Calgary-based Trout Unlimited have also expressed interest in working with the current local co-ordinator for the FRBP to expand learning opportunities in schools in the southwest of the province. Nature Saskatchewan would like to work with participating schools to create a website for their project and help link their monitoring activities to other community groups internationally through a web-based program called "Bridges" (see http://www.bridgesweb.org/). Similarly, Trout Unlimited is interested in directing private funding from an oil company working in the southwest towards integrating this program for water quality and monitoring into other public schools throughout the region.

6.2 Methodological Limitations, Implications, and Future Research

6.2.1 Comparing Methods

For students in Eastend, learning from their participation in the ecological monitoring program was multidimensional, with knowledge-based tests, photographic diaries, and interviews providing alternative evidence of these outcomes. Although it was not the intention of my research to compare different methods for assessing environmental education programs, there are some noteworthy observations that can be made concerning how one might evaluate learning. Knowledge-based tests did not effectively capture or reflect learning that was process-based (arising experientially, see Section 4.3.2); learning that was in the form of constructed meanings or values (see Chapter 5); or learning that was mutual and shared among participants, arising from social interaction in the project (refer back to Sections 4.2 and 4.4). Two philosophies and methodologies are of relevance in this case. The first, problem-based learning, relates to work by Woods (1996, no page number available) of McMaster University, which supports the idea of "learning subject knowledge in context of using and developing process skills." Similarly, while also recognizing the role of real life experiences as a means to construct knowledge, work on inquiry-based learning at the University of Calgary (2005) (often applied in the context of higher education) extends this position and emphasizes that collaborative experiences and engagement contribute to personal meaning and shared understandings among the learners – areas that are explicitly connected to the idea of building learning communities. Because the monitoring program included experiential, team-oriented, processed-based activities, and yet the tests only focussed on the subject knowledge being learned, the knowledge-based tests neglected to reflect the depth, breadth, and complexity of learning outcomes, including the impacts of experiential and participatory learning. Photographic diaries and interviews provided a more comprehensive understanding of the meaning behind participants' experiences - a process of knowledge construction that speaks to the quality of learning within the community, and which other educational theorists (particularly in the case of action research projects) claim is not static; there is no pre and post, or before and after in its conception, but rather this type of learning involves a dynamic process of action, reflection, and personal identification characterized by experiences, emotional outcomes, meanings, and values, within

which the acquisition of information and skills is merely one component (Mayer 1995; Wenger 1999).

Again, this work highlights that future research must pay greater attention to providing a more holistic description of what constitutes environmental learning, to account for the variability by which knowledge is expressed. Further, research methodologies developed to evaluate learning from environmental education programs are scarce, and there is little understanding of their relative strengths or weaknesses. These gaps are currently being explored through the Faculty of Education at the University of Sherbrooke (Pelletier 2005), using instruments that are moving away from quantitative approaches, towards qualitative methods that provide a more multi-faceted representation of learning outcomes, including environmental attitudes and citizenship practices. My own work supports the use of photo diaries in evaluation techniques, particularly in the context of environmental education and in CBEM research because they provide:

- a unique and comprehensive insight into the lived experiences of participants and the cultural context in which learning is generated, as a requisite to understanding learning outcomes for a particular social group;
- a more holistic portrayal of the values, interests, and attitudes held by participants; and finally
- a useful adjunct to other research methods (such as interviews), particularly in work involving young people, whose knowledge may be difficult to access using more traditional research approaches.

In this research, the epistemological differences between knowledge-based tests and the photographic diary-interview method related to both content (the information that was collected) and process (i.e. the *way* in which that information was collected). Some of these key differences are summarized in Table 6.0. Photo diaries allowed for a degree of democracy in the research because it was the participants who decided what to photograph and why, and not myself (as the researcher) (Castleden 2006). This chosen method also engendered therapeutic qualities by giving student participants the opportunity to confront some of the personal challenges that they encounter in their daily lives. Communicating through the use of symbols enabled them to express themselves indirectly, without necessarily having to speak explicitly about issues of personal significance. This

approach is especially important in working with teenagers who are often concerned about appearance, particularly as it relates to defining their own identity. Photo diaries are therefore, what I would term a "soft" method by which to gather local knowledge, in a way that is sensitive to participants' needs and allows them to contemplate and convey meaning within their own comfort levels.

Photographic diaries can be celebrated not only as a method that enables the researcher to access knowledge and meanings, but also as a vehicle for students to produce knowledge and meanings, in this case about place and the environment. Other researchers in education (e.g. Leonard 2003, McMahon 2002, Meadows *et al.* 1999, Stamovlasis 2001) advocate the camera's use in schools because it is experiential and facilitates social interaction among learners, and between learners and their surroundings. In this research, the camera brought into frame the significance of the prairie landscape, and other aspects of students' physical and social environment. The camera is a technological interface that remains largely underutilized by social scientists, with the potential to yield rich data and facilitate learning for both the researcher and the participants, in a variety of disciplines and topics of enquiry.

Table 6.0. Differences between selected research methodologies.

Characteristics	Photographic diary-interviews	Knowledge-based tests
Data type	Qualitative	Quantitative
Theoretical orientation	Democratic/participant-driven	Researcher-driven
Process	Participatory/experiential	Individual/cognitive
Information gathered	Environmental knowledge & meanings	Environmental knowledge
Limitations	Time-intensive, high-costs, & concerns over anonymity	Narrow scope of data

Despite the relative merits of this research method, there were several limitations evident:

- The initial cost associated with purchasing digital cameras (one for each student) was significant. However, as one way of giving back to the communities involved in this research, these cameras were left in each school

for their future use. Thus, this cost was offset by the relative long-term value for participating schools.

- Completing photo assignments and carrying out interviews required a significant time commitment and effort from research participants, as well as flexibility on the part of teachers within the school.
- Gathering accurate and reliable data required that participants have reasonable access and transportation to the sites that are meaningful to them. This limitation is particularly relevant to school-aged participants, who may not have the autonomy or resources to carry out research-related tasks.
- In giving control to participants over what they chose to photograph, the use of photo diaries had the potential to infringe upon the anonymity of other community members. Participants, and particularly young people, are inclined to photograph friends and family (as expressions of sense of place), as well as identifying those individuals in the interview setting.

A challenge that is inherent to researching the social-psychological dimensions of sense of place includes the danger of misrepresentation. Photo-diaries are a vehicle for research participants to express sentiments (thereby assisting researchers in accessing this information); however, photo-diaries alone do not provide the textured accounts that may be derived from oral narratives, and thus are not sufficient for the researcher to maximize accuracy in the interpretation of cognitive and emotional data. Experiences drawn from this work support the combined use of photo-diaries and interviews as a way to develop a richer understanding of the whole picture as presented by the subjects, hence minimizing some of the risks associated with this type of enquiry.

6.2.2 Researcher or Facilitator? Reflections on Being Situated Within a Learning Community

As with other types of action research, the boundaries between the research process and the ecological monitoring program were interwoven. One cannot separate either of these experiences from the other when evaluating the role of the learning community and its impact on students. The time, as well as the physical and social space allocated to the development and implementation of the monitoring program were

simultaneously occupied by activities relating to this Master's research. To illustrate this point of convergence, early in the implementation of the program, I was invited to be a guest speaker for the Grade 10 students in their Career and Work Exploration class because they were doing an assignment in which they had to answer the question "Who am I?"[35] Students were asked to reflect on their identity, including the place from where they come, as well as considering their valued activities, skills, and desires, as a basis for contemplating future career interests and life more generally. The photographic diaries that became central to my data analysis were delivered during this class, with the intent to fulfill requirements for my own research and also to complement this course assignment on identity. As an outsider to the community, bringing my own life experiences to the town of Eastend, the school principal requested that I introduce myself and this research to the Grade 10's by sharing my own stories. Thus, I was recounting my own personal history and sense of place to the very students who would, within days, be sharing their experiences with me. This exchange of information and story-telling fostered mutual learning between the students and myself; I learned about the lived experiences of students growing up in a rural prairie setting, and at the same time they learned about my perspective of life on the West Coast of British Columbia, as well as the university-based research project that had brought me to their Eastend classroom.

It is important to consider that most of these students had never travelled beyond the Saskatchewan border, and some of them had never left the Southwestern corner of the province. As a result of this exchange, students often communicated what they valued about their place through direct comparison with a place to which they knew I could relate, as illustrated in their description of the prairies where "you don't feel like [you are] always expanded in," making reference to the contrasting geography of the west coast as "always trees, its just trees and you can't see anything else but trees."

> I've heard people come from the mountains and they come into the Eastend Valley and they're like "wow are we getting close to the mountains again" because they're used to seeing the flat prairie from driving here, and [in Eastend] it's not quite an oasis but…because there's the cypress hills area and then for miles and miles out into Alberta and Manitoba it's

[35] Other researchers have proposed that answering the question "Who am I?" is a way to gain insight into the group identity of the research subject, reflecting the social values and cultural experiences held by an individual (e.g. Samuelson *et al.* 2003).

> just prairie…the fact that it's not just you can see just straight to Saskatoon, it's you can look at something and kind of have the feeling "woohoo," we are so lucky to live here. (student participant 5b)
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> ~

This context of mutual learning and enquiry served as an early reference point for students to begin contemplating those aspects that make living and growing up on the Canadian prairies unique, demarcating *their place* and *my place*, or the perspective insider's place from outsider's place, while also helping to re-affirm students' entrenched attachment to their own region. The practice of asking students to take pictures of what place meant to them and for them to recount those experiences in interviews helped to solidify these place meanings - arising from an internal dialogue where they were contemplated, articulated, and re-negotiated - adding value to previously taken-for-granted aspects of their everyday experience in Eastend. As a result, the engaging and self-reflective nature of this process incited some of the learning outcomes that this research was purporting to measure.

Wells (1998) supports these observations, describing dialogue as central to knowledge building. He suggests that these processes are part of a joint endeavour termed "dialogic responsivity," whereby in communicating meaning to others, individuals may achieve a clearer understanding for themselves.[36] Memories of childhood experiences and interpretations of place were the results of a subjective interplay between the researcher (myself) and the participants (the students). Students' conceptions of place were therefore influenced by variables such as who was relaying and who was interpreting. Considerations of age, gender, and differences in our own personal histories inevitably entered this dialogue, and hence my research findings. These observations parallel Smagorinsky's (1995, 201) work, which also suggests that "when researchers enter a socio-cultural setting to conduct research on developmental processes, they become part of that setting," and thus, the research invariably becomes an important mediating factor in the acquisition of knowledge.

In essence, my role was both that of a researcher of, and a facilitator for, participatory learning. The meaning of place was illuminated through me asking students to contemplate what they valued in their community and their region. The act

[36] In this research, part of this dialogue also included the use of symbols. Photographic images and narrative were important mechanisms for both the internalization and communication of cultural meanings.

of letting them tell me what is important, something that they would define themselves and catalogue through photographs, was a way of handing over more power and responsibility to students, as experts of their knowledge, which made them feel that their lived experiences were valuable. At first when asked this question "what does place mean to you?" or "why is this place, Eastend, this region, your community important to you?" students simply did not comprehend the notion that there could be much about this place that was worthwhile mentioning to an outsider, as illustrated in comments such as "there is not a whole lot in Eastend" (student participant 4b) and yet, this description contradicts what they later portrayed in interviews – mirroring the observations of other researchers who describe the often fragmented or contradictory nature of students' communication of meaning (Leyshon 2002). As a result of this self-assessment process (by engaging in the research and creating photo-diaries), students eventually did feel that conceptions of place were difficult to put into words, but not because there was no meaning or because they did not understand the concept, but rather because there was too much emotion, feeling and value for their place that it was difficult to break down into simple terms and articulate.

6.2.3 Expanding the Learning Community

Despite sharing common values for land use and conservation as well as an agricultural economy, community members in Eastend and Val Marie have indicated that they see their own communities as being very different from one another. These differences resulted in divergent choices with regard to participation in the monitoring program and the larger FRBP. In Val Marie, the presence of Grasslands National Park, and the history of research and tensions over conservation in the area were significant factors in decision-making. The decision not to work jointly with the FRBP as "full" participants meant that Val Marie students would also have a different learning experience – one that may have included a heightened awareness of the complexity and opposing environmental values and attitudes surrounding a stewardship project. By contrast, in Eastend, participatory environmental learning was characterized by the symbolic significance of being part of a larger research initiative and in knowing that they were doing something with and for their community. Lave and Wenger (1991) concur that meanings such as sense of belonging are at the heart of learning within a learning community. Moreover, this research suggests that a learning community is not just about belonging as "full"

participants and gaining environmental knowledge as an outcome, but it is also about the *sense of belonging* that participants' experience in the process of learning through community membership. In essence, participation in this project was responsible for driving the content of learning. More specifically, striving for a process that constitutes "full" participation is what expands learning in a learning community through the creation of symbolic meanings. In my view, despite having access to the same resources, participants in Eastend were able to benefit more fully from the experience, underscoring the value of broadening and strengthening participation.

One of the challenges in any CBEM initiative is for this participation to be made meaningful for participants. Matthews and Limb (1999, 80) refer to the "tokenism" that often characterizes children's involvement in these environmental projects, where young people serve a largely decorative role and although they seem to have a voice, they have no real say in influencing outcomes. Similarly, in the case of the FRBP, regardless of the symbolic meanings generated for students, which can be credited to their involvement, there was a lack of joint participation between students and researchers. Bringing these young people and adults together in the classroom, the field, and decision-making activities relating to the broader biodiversity project may have been able to contribute to greater cohesion within the learning community.

Community members in Eastend and Val Marie have also expressed that historically, being excluded from decision-making and planning related to local research and government activities (and even in more recent cases such as the FRBP, where local people have been invited to participate) has made them feel like outsiders within their own community. In taking into account these desires for more meaningful forms of community participation, as well as interests in maintaining the long-term viability and self-sufficiency of the monitoring program, I believe that this action research project could have created a wider, and even more significant impact had local people, including parents (and in Val Marie, GNP staff) played a larger role in its planning, implementation, and evaluation. In retrospect, increasing the overall impact of the project could have been accomplished by conducting interviews and focus groups with other key members of this learning community. More specifically, this would have permitted a broader representation of voices, while also providing me with a more in-depth and comprehensive view of how the

project could have been made more meaningful to local stakeholders (such as ranchers/land-owners, parents, and parks staff) and research participants. Delimitations on the scope and timeframe of this Master's research led me to focus on the role of a learning community in facilitating knowledge acquisition from the perspective of primarily student and teacher participants; however, I found this view of the learning community to be narrow, and restrictive at best. For example, insights from parents, who were both directly (e.g. enabling the science class to access the river from sites on their property) and indirectly (e.g. through the transfer of knowledge between children and parents) part of this community, would have helped to guide the direction of educational activities and to evaluate the nature and extent of students' learning outcomes. In addition, interviewing representatives of the FRBP steering committee and Grasslands National Park staff could have produced valuable insights in this research, which could have been applied elsewhere for groups carrying out future work in collaborative, multi-stakeholder stewardship projects. In practice, the lifestyle of ranchers and farmers, which is largely governed by the seasons, makes it difficult to solicit parental involvement and community participation. However, creating these opportunities for community input and dialogue (and according to a schedule that was amenable to local residents) in itself would have been an avenue for more meaningful participation, involving a wider range of interest groups and building greater linkages between project participants and communities. In short, finding ways to expand this involvement and to maximize stakeholder representation in project development and the research process must be strongly considered in conducting future community-based research, where principle objectives include working towards the creation of a learning community.

6.2.4 Significance of Study and Future Research

"It makes me a country girl, I'll tell you that" (student participant 8a).

In attempting to define an agenda for the geography of children, Matthews and Limb (1999, 61) speak to the often fragmented and narrow disciplinary perspectives in the investigation of children's lives, as well as methodologies which are often criticized for inadequately observing the social constructions and experiences of children in the "here and now." Conducting social research with

youth in rural communities requires that investigators understand the significance of social interaction and culture to their lived experiences, while also recognising the importance of this context for learning and meaning formation (see also Budwig 2003; Cole 1985; Smagorinsky 1995). In revealing how an ecological monitoring program influences students' perceptions of place and environmental awareness, this research augments existing definitions of sense of place and contributes to a conceptual understanding of the process by which meaning is attributed to the physical and social environments of these participants. Through these explorations, my work contributes to a limited, but growing area of research involving the social constructions of rural young people, a view of sense of place that has traditionally been conceived from work with and by adults (e.g. Leyshon 2002; McCormack 2002). Specifically, this work provides a detailed account of what students define as being important to them, growing up in a prairie town.

The process of meaning construction that I have described in this thesis may serve as an analytical tool for characterizing sense of place, and also provides a theoretical approach to understanding how new experiences enter into this process. This description brings the concept of sense of place into the area of cognitive development, contributing to related work in socio-cultural theory. More specifically, this framework brings together social and constructivist learning theory within the context of participatory and experiential environmental learning and relates these concepts to a social psychological definition of sense of place.

While investigating these learning outcomes, I also present a theoretical model of transformative learning to illustrate how meanings acquired through this project may translate into future commitments to stewardship. However, in practice, this model may not account for the true complexity of how environmental knowledge and attitudes may materialize in the form of actions. In particular, I also raise questions as to the ability of environmental learning outcomes to shift attitudes that are deeply entrenched in identity. This research affirms that learning occurs within a cultural substrate of existing knowledge, perspectives, beliefs, and values. Again, this highlights why the examination of place was critical to understanding learning outcomes. Socio-cultural theory emerging from Vygotsky's work in cognitive development lends further perspective to these observations, particularly with respect to how factors such as social and cultural setting influence knowledge production.

This discussion also bears implications for how we evaluate *learning* in a learning community. In this project, I demonstrated that learning is a mutual and symbolic exchange between the researcher and the research subjects, and therefore cannot be examined in isolation from the research context.

Because reliable methods designed to assess learning resulting from environmental education programs are scarce, I also provided a critique of the effectiveness of the quantitative and qualitative methods used in this research to examine the full range of students' learning outcomes. In so doing, I contribute to a much-needed discourse on methods for studying rural youth (Jones 1997; Leyshon 2002; Matthews and Limb 1999). This includes offering methodological suggestions for future research with young people that may lead to meaningful learning experiences, characterized by participation, empowerment and self-discovery - methods that mediate cognitive development and the construction of new meanings, but which are unencumbered by the adult gaze.

Perhaps some of the most valuable contributions made by this research have been realized in the participating communities themselves. The implementation of an ecological monitoring program created opportunities for continued environmental learning and river stewardship in local schools. This study helped to validate that school-based ecological monitoring *can* achieve objectives for both environmental education and stewardship and affirmed that CBEM projects *can* be inclusive of youth. In so doing, I also highlighted some of the practical and socio-political challenges that arise in creating partnerships between schools and outside groups in the context of conflicts over land use and conservation, and suggested ways in which a learning community can be nurtured for more effective CBEM.

In drawing conclusions about what appears to be a profound influence of this cultural landscape on student's sense of place (as places where students "grow up"), particularly grounded in their memories of childhood and past experiences in nature, this research lays the groundwork for further inquiry into how young people living in other contexts negotiate their surroundings and what meanings they may derive through participation in similar stewardship programs. Identity is critical to consider in this discussion. Environmental organizations, agencies, and citizens are increasingly concerned with the disconnect between children and nature, particularly among young people growing up in urban areas (e.g. Louv 2005). Thus, there may be justification for also examining value systems of urban youth in reference to

nature, and how differing conceptions of place may help (or hinder) educational programmers and environmental planners to establish environmental education activities that are meaningful to people in these settings. In the Canadian context, this work may be particularly relevant as government agencies and conservation groups, such as Parks Canada and Nature Canada through the Parks and People Program (2005), seek ways to create learning experiences for young people in national parks or rural places like Val Marie or Eastend, which are rich in cultural and natural capital.

If the broader mandate for environmental education is to incite changing attitudes and actions towards the environment (Environment Canada 2002), then the long-term success of such efforts to promote and support experiences that help to connect young citizens with the environment may ultimately be predicated upon producing behavioural changes through participatory and experiential environmental learning. While there have been recent movements towards exploring environmental attitudes and actions resulting from environmental education in schools (e.g. Brinn 2003; Pelletier 2005; Tapsell *et al.* 2001), this work is also scarce. These studies tend to focus on classroom-based programs that may not be experiential or locally situated, or they investigate activities such as recreational uses of natural resources rather than stewardship. Further work is required to identify how learning that arises from stewardship activities such as ecological monitoring may influence students' attitudes towards the environment, and eventually translate into environmentally sustainable practices. This thesis demonstrates the value of such an approach and identifies opportunities for ongoing learning and action - experiences that enable young people to have a *place* in their communities.

Plate 5: Many thanks to the teachers and students from Eastend (top left) and Val Marie (bottom right) Schools for their hard work and enthusiasm in monitoring the Frenchman River.

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Appendix A (i): Timetable of ecological monitoring activities for Eastend School (Note: activities in Val Marie followed a similar schedule)

Friday, September 17th, 2004

Field Activities: Collecting the samples

- Select site
  - make sure you choose a site at least 10m from other teams
- Record GPS coordinates
- Photograph river & take compass reading
  - take a minimum of 4 photos per site – 1 upstream, 1 downstream, & 1 across the width at each riverbank (i.e. 2 in total)
- Collect water sample
- Measure pH (use LaMotte's kit)
- Measure air and water temperature (from LaMotte's kit) – try to take the water reading under water if possible
- Collect aquatic invertebrates
  - (follow steps 1-8 in guide; the remaining steps will be performed in-class)
- Perform dissolved oxygen test at river side (use LaMotte's kit)
- Measure river morphology (depth and width) and stream flow speed

In-class activities following field trip: identifying & counting invertebrates

- Identify and count aquatic invertebrates – follow remaining steps in the guide.
- Perform coliform test on water sample. Leave sample over weekend (min. 24 hours) in a warm, upright position. Return Monday to record results.

Monday, September 20th, 2004

- Record results of coliform bacteria test ("yes" or "no" response) on data sheet.

Tuesday, September 21st, 2004

Water Quality Analysis

- Perform remaining water chemistry tests using water samples provided. Record results of analysis on data sheet. Eventually you will compile your data totals for each site in an excel spreadsheet, in order to create a database for monitoring ecological change in the Frenchman River.

Appendix A (ii): Sample of activity instructions for ecological monitoring program (Part 5 of the a "School-Based Ecological Monitoring Curriculum Guide," 2004)

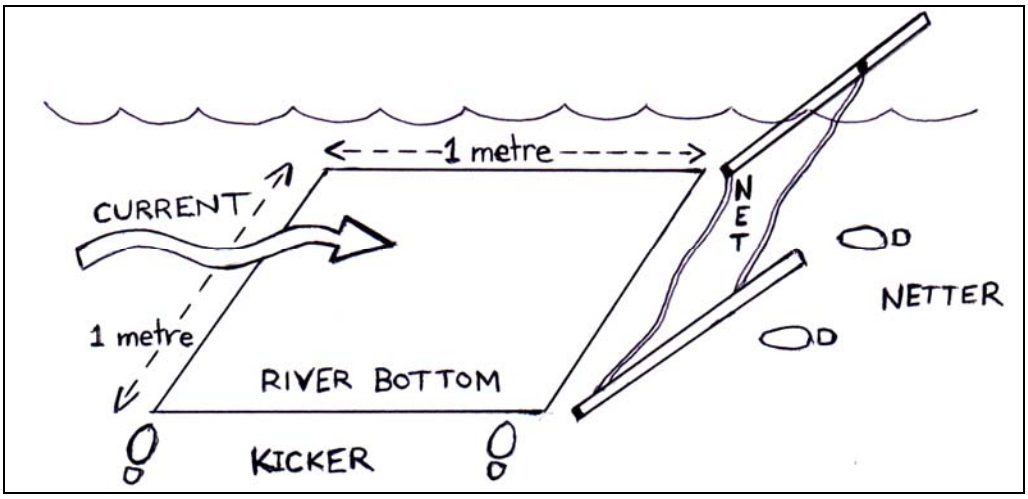
Part 5: A Step-by-Step Guide for the Collection of Aquatic Invertebrates

Procedures for collecting small invertebrates:

1) Select a site that is shallow, with rocks and gravel, and where there is moderate flow velocity. Wear boots or waders.

1) Enter the river downstream from the place where you will be collecting aquatic invertebrates. Try not to disturb the ground where you have chosen to collect until the net is set.

2) Set the net - one or two people hold the net in the position shown below. The net should be firmly set on the ground so that material does not escape underneath.



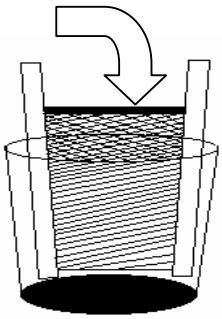
4) The kicker stands beside the 1 metre sample area but not inside it (use feet to estimate and mark 1 metre boundaries).

5) The kicker now begins to pick up each larger stone in the sample area and wash it off underwater with hands in front of the net. Clean stones are set down outside the sample area.

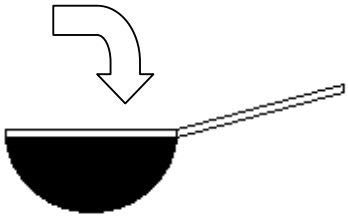
6) Once the larger stones have been brushed off, the kicker steps into the sample 1 metre square at the upstream end and begins to twist and gently kick feet, working towards the net for 60 seconds.

7) The netter scoops the net at an angle so that the sample stays on the net, and lifts the net out of the water.

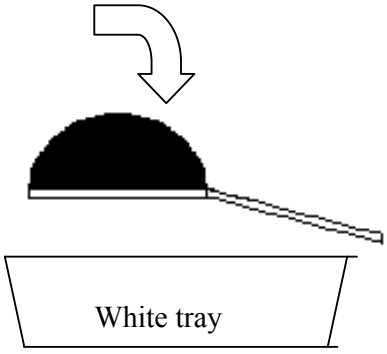
8) On shore, place the net into a large bucket. Use the tray with some river water to wash the contents of the net into the bucket.



9) Now pour the bucket through the strainer and on to the ground in order to concentrate the sample. Make sure nothing is left in the bottom of the bucket and that all material is collected in the strainer.

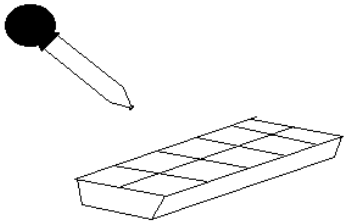


10) Invert the strainer over the tray. Pour a small amount of water on the strainer's underside to clean out its contents into the tray.



11) Now you should have the invertebrates in a shallow layer of water in the tray. Use the turkey baster to remove small invertebrates from the tray and sort them into the

ice-cube tray for identification and counting. Leave larger invertebrates or small fish in the tray for separate identification.



12) Identify and count all of the invertebrates in your sample, using the *Quick Guide to Major Types of Freshwater Invertebrates in the Frenchman Watershed* to help you. Record data on the invertebrate data sheet. When you have counted accurately, release the invertebrates back into the river from where they were taken.

Procedures for collecting large invertebrates:

If there is a concentration of rocks and pebbles on the riverbank:

1) Select an area on the riverbank, just at the waterline. Look for macro invertebrates on the underside of large rocks and stones, as well as in the depressions where the rocks once lay. Set the rocks aside temporarily, away from the sample area.

2) Photograph all large invertebrates and record photograph details on the photo-recording sheet. It may be helpful to place a manmade object (e.g. a pen or ruler) adjacent the invertebrate you are photographing to help demonstrate the scale of the subject.

Photo tip: Make sure to get close to the subject you are trying to photograph in order to fill the photo frame with your subject, while avoiding the use of digital zoom. These photos will help you to recall and identify the invertebrates once you have returned to the laboratory.

3) Measure the width and length of macro invertebrates. Record measurements on invertebrate data sheet.

4) Once you are finished, return rocks and large invertebrates to the area of the river from where they were taken.

(Adapted from Alberta RiverWatch, 2001)

Appendix B: Student knowledge-based test

Name: _____
Date:

TEST YOUR KNOWLEDGE OF THE ENVIRONMENT

1. Which area of Canada was found to be the most "at risk" from loss of biodiversity?
   a) the Rocky Mountain area
   b) southern Newfoundland
   c) southern Saskatchewan*
   d) southern British Columbia

2. What is biodiversity?
   a) a name for the different sub-fields of biology
   b) the relative abundance of different genes, species, and ecosystems on Earth*
   c) water, air, and nutrients necessary to sustain life
   d) the diversity of chemical elements on earth - the building blocks of all matter

3. Why is biodiversity important?
   a) economic reasons
   b) for the production of medicines
   c) ecological services that species provide
   d) aesthetic and philosophical importance
   e) all of the above*

4. What percentage of the wetlands in the Prairie Provinces have been drained for agricultural purposes?
   a) 10 %
   b) 30 %
   c) 40 % *
   d) 70 %

5. What factors make frogs, toads, newts, and salamanders highly sensitive to a variety of environmental stressors?
   a) their permeable skins
   b) their low mobility
   c) their complex life cycles (both aquatic and terrestrial)
   d) all of the above*

6. All of the following factors threaten aquatic ecosystems EXCEPT:
   a) intensive livestock production near streams
   b) "run-off" water from impermeable surfaces such as paved roads, and effluent discharges from sewers
   c) ecosystem stewardship*

d) agricultural use of pesticides, herbicides, and fertilizers

7. In Canada, it is estimated that _____ species of mammals, birds, reptiles, fish, molluscs, butterflies, moths, and plants are “at risk” or have been eliminated:
   a) 4
   b) 40
   c) 441*
   d) 4,000

8. Monitoring rivers is important for all of the following reasons EXCEPT:
   a) to contribute to scientific knowledge of aquatic ecosystems
   b) to detect changes over time in the state of natural systems
   c) to assess the health of a river
   d) to ensure that the water looks 'crystal' clear at all times*
   e) to take personal action on behalf of the environment

9. An effective method by which to measure the speed of water flow in a river would be:
   a) to see how long it takes to fill a bucket of known volume at the surface
   b) mark two points in the channel a specific distance apart and time how long it takes for a floating object to traverse that distance*
   c) use a barometer
   d) to walk on the riverbank at a given pace while watching an object float downstream

10. The following parameter(s) is/are used in a water quality index for the protection of aquatic life:
   a) dissolved oxygen
   b) pH
   c) heavy metals
   d) all of the above*

11. An ecozone is:
   a) a community that has declared itself to be environmentally friendly
   b) a place where wildlife is protected
   c) a geographic region that has certain shared physical and biological features*
   d) an area where resource activities such as forestry or farming are prohibited

12. A riparian area is:
   a) green strips of land along rivers and around ponds and lakes where water-loving plants grow*
   b) an area where farmers grow fruit, using an irrigation system to supply water
   c) a fast-moving part of a river that is full of ripples and rapids
   d) a body of water formed by the construction of a dam
   e) area at the interface between a forest and a field

13. The average Canadian uses this much water every day:

a) 25 litres
b) 100 litres
c) 200 litres
d) 320 litres *

14. What percentage of the Earth's total water supply is fresh water that can directly be used for domestic, industrial, commercial, and recreational purposes?
a) 1 %*
b) 3 %
c) 33 %
d) 50 %
e) 82 %

15. All of the following are invertebrates EXCEPT:
a) jellyfish
b) insects
c) crayfish
d) frogs*
e) spiders

16. A watershed is:
a) what a dog makes when it jumps out of the water
b) an area of land that drains water into a river or lake*
c) a building covering a well or spring
d) a shed used for long-term or emergency water storage

17. Nitrates are of major concern in human health. Nitrates can enter drinking water supplies through:
a) sewage
b) livestock manure
c) fertilizers
d) all of the above*
e) none of the above

18. Aquatic invertebrates have:
a) a backbone which helps them to swim efficiently
b) zero tolerance for living in salty, ocean water
c) a life cycle which is at least partly underwater*
d) a bright blue or green colour

19. Incomplete insect metamorphosis includes:
a) a small-winged larva stage
b) a cocoon-like pupae
c) a nymph that grows successively larger by moulting*
d) a feeding stage where the insect resembles a caterpillar

20. Which of the following may lead to low dissolved oxygen?
a) excess organic nutrients*
b) cold water temperatures
c) water turbulence

d) photosynthesis by underwater plants and algae

21. An aquatic organism that requires the highest level of dissolved oxygen is:
    a) a snail
    b) a leech
    c) a trout*
    d) a water boatman

22. An ecosystem is made up of:
    a) assemblages of organisms together with their physical and chemical environments*
    b) environments and organisms at the surface of the earth
    c) many organisms of the same kind
    d) many populations of different kinds living in the same place

23. "pH" is a scale of acidity or basicity: the logarithm of the concentration of hydrogen ions (H^+), which is often used to measure water (H_2O) quality. Which of the following pH levels would be most suitable for maintaining aquatic life?
    a) a pH of between 1 and 3
    b) a pH of between 3 and 4
    c) a pH of between 6 and 9*
    d) a pH of between 9 and 12

24. Which of the following aquatic invertebrates DOES NOT belong to the Phylum Mollusca in the *scientific classification* system:
    a) snails
    b) fresh water earthworm*
    c) clams
    d) octopus

25. A eutrophic body of water is:
    a) a deep, clear lake with low nutrient supply, low organic matter, high transparency and high dissolved oxygen
    b) a body of water which contains a specific mixture of salt water and fresh water
    c) a body of water which has excessive concentrations of plant nutrients causing excessive algae growth, low transparency, and low dissolved oxygen*
    d) a stream or lake that flows into a larger stream, river, or lake

26. Which water quality test is used to measure how well a body of water is able to resist increasing acidity:
    a) alkalinity test*
    b) pH test
    c) turbidity test
    d) temperature test
    e) dissolved oxygen test

27. A scientist is:
    a) someone who uses the scientific method to test hypotheses

b) a person that works in a laboratory or in “the field”
c) a researcher that systematically investigates and studies materials, sources, etc. in order to establish facts and reach conclusions
d) is a local community member who practices ecosystem management by monitoring water quality and other environmental parameters
e) all of the above*
f) none of the above

Table B1: Knowledge-based test questions, topic areas, and corresponding sources

Question Numbers	Topic Area(s)	Source
1, 3, 5,	Biodiversity, ecology	Draper, D. 2002 *Our Environment: A Canadian Perspective* 2nd ed. (Scarborough, ON: Nelson Thomson Learning)
2, 4, 13, 17,	Biodiversity, land use, water resource consumption, water chemistry	Draper, D. 1998 *Our Environment: A Canadian Perspective* (Scarborough, ON: International Thomson Publishing)
11, 12, 16	Ecological terminology	Partners for the Saskatchewan River Basin. 2004 'Water Watchdog Quiz' http://www.saskriverbasin.ca/watchdog/quiz.htm
24	Taxonomy	Proctor, H. 2004 *Quick Guide to Major Types of Freshwater Invertebrates in the Frenchman Watershed* Unpublished field manual, the University of Alberta
7	Species at risk	Committee on Endangered Species in Canada (COESWIC) 2004 'Canadian Species At Risk' (also available from http://www.cosewic.gc.ca/eng/sct0/sar_2004_11_e.cfm)
18, 19, 20, 21	Aquatic invertebrate biology, water chemistry	Alberta RiverWatch. Accessed 2005 'River Watch' (Beyond Books Institute of Alberta 1999-2001) http://www.riverwatch.ab.ca/
8, 10,14, 25	Water quality, water supply	Campbell, G. and Wildberger, S. 1992 *The Monitor's Handbook: A Reference Guide for Natural Water Monitoring* (Chestertown, MD: LaMotte)

Appendix C: Photo-diary assignment

Take-home assignment:
Create a photographic diary of place

ACTIVITY INSTRUCTIONS:

1) **Take as many photographs as you like of what *place* means to you. These will be pictures of anything (i.e. objects, environments, locations), or aspects of your environment that are meaningful or interesting to you. Your photographs will be used to create a large mural, or map of your local community and region, entitled "my favourite places."**

2) **For each photograph you take, please fill out the table below.**

3) **Please be careful with the digital cameras, and return them to the school on TUESDAY, SEPTEMBER 28TH.**

Note: You may wish to work in pairs for this assignment to ensure your safety at all times during outdoor activities.

Have Fun!

Photo #	Brief description of photograph	Brief description of where picture was taken.	Notes (why did you take this picture?)
1			
2			
3			
4			

Note: sample of photo-log sheet only, original version accommodates 20 photographs.

Appendix D(i): Pre-program interview schedule for student participants

INTERVIEW SCHEDULE:
PRE-PROGRAM STUDENT INTERVIEWS

The following questions are to be asked in a face-to-face interview with student participants. All questions will be posed in reference to each of the 5 photographs students have selected to discuss.

1. To begin, would you describe why this picture interests you?

2. Would you share your reasons for taking this particular photograph?

3. (if not previously addressed) What is meaningful about this (object, place, subject)?

4. Is there anything else that you wish add about the importance of this image?

5. Does the image truly represent how you think of this (object, place, subject)?

    a. If yes, describe those features. *(an answer could be something like: e.g. the stream is always blue just like in the photo…)*

    b. If no, how would you like the photo to look? *(the stream is too dark in the photo…it's always a light blue. I always think of how clear it is, the picture doesn't really show that).*

---after discussing all 5 photographs---

6. Tell me about any other photographs that we have not yet discussed, but which reflect what place means to you (prompt: anything that is meaningful or interesting to you).

Appendix D(ii): Post-program interview schedule for student participants

INTERVIEW SCHEDULE:
POST-PROGRAM STUDENT NTERVIEWS

Note: Remind students to be as **descriptive and open** as possible in their responses.

(I) **Questions relating to their photographs** (repeated as in pre-program interviews)

1. To begin, would you describe why this picture interests you?

2. Would you share your reasons for taking this particular photograph?

3. (if not previously addressed) What is meaningful about this (object, place, subject)?

4. Is there anything else that you wish add about the importance of this image?

5. Does the image truly represent how you think of this (object, place, subject)?

    a. If yes, describe those features. *(an answer could be something like: e.g. the stream is always blue just like in the photo…)*

    b. If no, how would you like the photo to look? *(the stream is too dark in the photo…it's always a light blue. I always think of how clear it is, the picture doesn't really show that).*

---after discussing all 5 photographs---

6. Tell me about any other photographs that we have not yet discussed, but which reflect what place means to you (prompt: of anything that is meaningful or interesting to you).

(II) **Questions relating to the monitoring program**

7. Would you describe what you liked about participating in the ecological monitoring program?

8. What did you dislike about participating in the ecological monitoring program?

9. How did the ecological monitoring program (including both outdoor and in class activities) help you to learn more about your local environment?

    a. Which activities in particular were helpful (for you to learn more about your local environment)?

b. If none, why not?

c. (following from 9a) Which activities in particular were helpful for you to learn more about your local environment (use prompts provided below)?

- ❑ Classroom lessons about water quality and ecosystem health
- ❑ Collecting aquatic invertebrates in the river
- ❑ Measuring river flow speed, width, depth etc.
- ❑ Taking photographs of the river and aquatic invertebrates
- ❑ Measuring water chemistry at the riverside
- ❑ Analyzing water chemistry in the classroom
- ❑ Identifying aquatic invertebrates/Biodiversity in the classroom (using microscopes & identification cards)
- ❑ Using technical equipment (GPS, digital cameras, compass, water chemistry kits)
- ❑ All outdoor, "hands-on" activities
- ❑ All in-class activities
- ❑ Map – "our favourite places"
- ❑ Other

10. What did you learn about your local environment that you did not know before?

11. In what ways did the ecological monitoring program (including outdoor and in class activities) affect how you feel about your *place* (your community, this place you call home)?

    a. Which activities in particular were helpful in influencing how you feel about this place?

    b. If none, why not?

    c. (following from 11a.) Which activities in particular were helpful (use list of prompts below)?

- ❑ Classroom lessons about water quality and ecosystem health
- ❑ Collecting aquatic invertebrates in the river
- ❑ Measuring river flow speed, width, depth etc.
- ❑ Taking photographs of the river and aquatic invertebrates
- ❑ Measuring water chemistry at the riverside
- ❑ Analyzing water chemistry in the classroom
- ❑ Identifying aquatic invertebrates/Biodiversity in the classroom (using microscopes & identification cards)
- ❑ Using technical equipment (GPS, digital cameras, compass, water chemistry kits)

- ❑ All outdoor, “hands-on” activities
- ❑ All in-class activities
- ❑ Map – “our favourite places”
- ❑ Other

12. What do you know now about your *place* that you did not know before the program?

13. How would you change about the ecological monitoring program in order to help you learn more about your local environment?

(III) **Questions relating to the development of a learning community**

14. How do you feel about sharing/contributing the ecological data that you collected in the monitoring program

    i) with another school in the region?
    ii) to the Frenchman River Biodiversity Project?

15. How did you feel about being part of a larger research project (i.e. the Frenchman River Biodiversity Project, or a University of Saskatchewan based study)?

16. (if not previously addressed) What aspects did you like about having guests from “outside” the school (i.e. myself, [the representative] from the FRBP) to participate in your learning and class activities?

17. Do you have any suggestions for how this program might be improved the next time it is run?

18. Anything else you want to add?

Appendix D(iii): Post-program interview schedule for teacher participants

INTERVIEW SCHEDULE:
POST-PROGRAM TEACHER INTERVIEWS

1. Why did you wish to participate with your class in the ecological monitoring program?

2. (if not previously addressed) What about this program was interesting to you?

3. How would you describe your class's experiences participating in the ecological monitoring program?

4. How would you describe your experiences as a teacher participating in the ecological monitoring program?

5. How do you perceive the impact, if any, of the ecological monitoring program in contributing to your students':

    a) interests in learning about the local environment, and
    b) understanding of ecology/environmental issues in the region?

    If you noticed an impact, what specific aspects were of most value and why?

6. More specifically, how did you find the experiential, hands-on aspect of the ecological monitoring program in contributing to students':

    a) enthusiasm for learning?
    b) understanding of their local environment?
    c) sense of place?

7. Would you continue incorporating this program into your classes in the future?
    If yes,
        a) explain why?;
        b) how frequently throughout the school year do you think you will you implement the program?;
        c) into which classes?
    If not, why?

8. In what ways has your linkage with the university, the FRBP, and other schools participating in the program, helped you to develop and incorporate these ecosystem stewardship activities in your science curriculum?
    If yes, in what ways?
    If not, why?

9. What does the phrase "learning community" mean to you?

10. Do you feel that your class's participation in the ecological monitoring program has contributed to what you have described as a "learning community"?
    If so, in what ways?
    If not, explain.

11. Would you describe your science class as being part of network of individuals or groups committed to sharing information and practicing ecosystem stewardship as part of a joint project?
    If yes, in what ways?
    If not, why?

12. What were some of the challenges for you or your class in participating in the monitoring program?

13. Please indicate what tools that you, as the teacher, would need, or measures that you feel would need to be taken (if any) in order to better facilitate ecosystem stewardship activities within the school?

14. Anything else you wish to add?

Appendix D(iv): Follow-up interview schedule for teacher participants

INTERVIEW SCHEDULE:
FOLLOW-UP TEACHER INTERVIEWS (February 2005)

1. What lasting impacts, if any, has your class's participation in the ecological monitoring program had on students?

2. What lasting impacts, if any, has your class's participation in the ecological monitoring program had on your own teaching?

3. What has been the nature of feedback, if any, from parents and community members regarding the monitoring program?

4. Since the implementation of the ecological monitoring program, have you maintained contact with the other school that also participated in the program in your region (i.e.Val Marie or Eastend)?
   Explain. (prompt: if yes, how frequently, and in what ways have you communicated, e.g. meeting, telephone, e-mail, fax)?

5. Would you disagree or agree with the statement that "the experience of participating in the ecological monitoring program has contributed to sustained relationships between this school and other groups (e.g. with the FRBP or other school's in the region)"?
   Explain. (prompt: what is the nature of your relationships with other participants?)

6. (if not previously addressed) Can you tell me what measures that you feel would need to be taken, or tools that you as the teacher (and/or the school) would need in order to help develop partnerships with other schools, community groups, or institutions to facilitate ecosystem stewardship activities within the school?

7. Is there anything else that you would like to add at this time (prompt: anything you encountered since our last interview, i.e. challenges, achievements)?

Appendix D(v): Post-program interview schedule for participating principal

INTERVIEW SCHEDULE:
PRINCIPAL INTERVIEWS (October 2004)

1. How would you describe your community's participation in school events?
    a) Very High
    b) High
    c) Moderate
    d) Low
    e) Very Low
    f) Not at all

2. How frequently would you describe your school's involvement in joint activities with other schools in your region?
    a) Very often
    b) Often
    c) Sometimes
    d) Almost Never
    e) Never

3. Can you give any specific examples of school events where the local community, or other groups, organisations, or schools have come together to learn from, and advance a joint project?

4. In your view, what are some of the benefits of:

    a) developing partnerships for school activities or programs?
    b) community involvement in school activities or programs?

5. In your view, what are some of the challenges to:

    a) developing partnerships for school activities or programs?
    b) community involvement in school activities or programs?

6. In your view, what are some of the benefits of schools in the region coming together to learn from and advance joint activities or programs?

7. In your view, what are some of the challenges of schools in the region coming together to learn from and advance joint activities or programs?

8. Please indicate what measures that you feel would need to be taken, or tools that you as the principal (and/or the school) would need in order to help develop partnerships with other schools, community groups, or institutions that could facilitate ecosystem stewardship activities within the school?

9. What does the phrase "learning community" mean to you?

10. In what ways, if any, do you feel that your school's participation in the ecological monitoring program has contributed to what you have described as a "learning community"?

11. What impacts, if any, has this ecological monitoring program had on your school and its students?
    Explain.

12. Anything else you wish to add?

Appendix D(vi): Follow-up interview schedule for FRBP steering committee representative

INTERVIEW SCHEDULE:
FRENCHMAN RIVER BIODIVERSITY PROJECT
STEERING COMMITTEE MEMBER - A LOCAL COMMUNITY REPRESENTATIVE (October 2004)

1. In your view, what are some of the benefits of community involvement in school activities or programs?

2. In your view, what are some of the challenges to community involvement in school activities or programs?

3. In your view, what are some of the benefits of developing partnerships between schools and other groups or organisations to learn from, and advance a joint project?

4. In your view, what are some of the challenges associated with developing partnerships between schools and other groups or organisations to learn from, and advance a joint project?

5. Can you give any specific examples of school events where the local community, or other groups, organisations have come together to learn from, and advance a joint project?

6. To what extent is ecosystem stewardship a priority in your community?

    a) very high
    b) high
    c) moderate
    d) low
    e) very low

7. What role do you see the school playing in ecosystem management/stewardship in your community?

8. What role do you see the Frenchman River Biodiversity Project playing in ecosystem management/stewardship in your community?

    a) (if not previously addressed) What have been some of the benefits of this?
    b) (if not previously addressed) What have been some of the challenges to this?

9. Please indicate what measures that you feel would need to be taken, or tools that would be needed in order to help develop partnerships between schools and community groups, or institutions in order to facilitate ecosystem stewardship activities within the school?

10. What does the phrase “learning community” mean to you?

11. In what ways, if any, do you feel that the FRBP’s participation in, or contributions to the ecological monitoring program have contributed to what you have described as a “learning community”?

12. What impacts, if any, has this school-based ecological monitoring program had on your community?
    Explain.

13. (if not previously addressed) What impacts has this school-based ecological monitoring program had on students in the local school?
    Explain.

14. Anything else you wish to add?

Appendix E: Examples from photo-interview analyses

Table E1: Pre-program photo analyses

PRE-PROGRAM						
Student ID	**Photo #**	**Photo Subject**	**Theme**	**Meaning(s)**	**Student's own words**	**Selection of Significant Statement(s)**
1a		Basketball	Sport	Sense of accomplishment, attitude of "like"	**1.** Like sport, good at **2.** Effort **3.** Interest	**1.** "...its just a sport that I like and I'm I guess kinda good at." **2.** "...it's the only sport that I've ever really put effort into. " **3.** "when I first got into high school, we were open to the out of school sports, after school sports and that was the only one that I've ever had interest in going into"
1a		Foosball	Recreational Activity	Sense of accomplishment, attitude of "like"	Like hands-on, good at	*"...*I just like those kind of hands-on games I guess." "I am good at it."
		My House	Built Environment Home	Time spent, place attachment	Meaningful, where I live, where I grew up, where things happen	" I thought it was meaningful because it's where I live, it's where I've lived almost my whole life...its just where I grew up, its I guess where a lot of things happen."
1a		Horse	Family Farm/Pets	Sense of achievement, accomplishment, responsibility	Meaningful, responsibility	" I think she is meaningful to me because she is my responsibility."
		Cats	Family Farm/Pets	Familiarity, place identity	Tells a story...of the past	"We have so many cats. These particular ones, some of them aren't all that tame because their mother had them out in the bushes, we never got to see them and then they brought them out to the house and they have never been down to the barn. So those particular, I think nine stay up at the house."
	Other: photo not available	Steers/ Cattle	Family Farm	Representative of livelihood	Tells a story...of the present	"It was going to be a picture of our steers, or cattle...its how we, I guess, make our money...well, not now."

Table E2: Post-program photo analyses

POST-PROGRAM						
Student ID	**Photo #**	**Photo Subject**	**Theme**	**Meaning(s)**	**Student's own words**	**Significant Statement(s)**
1b	**1 No photo available**	Cattle	Family Farm	Symbolic of livelihood	Make our living	"It's basically how we make our living."
1b		Yard & House	Family Farm	Sense of freedom (lifestyle associated with a particular place), attitude of like, aesthetic value, nature experience, familiarity, appreciation for country life	**1.** Privileges vs. restrictions, **2.** Peaceful, sight of it, country **3.** tells a story...of experiencing it **4.** Where I live, learn **5.** Used to it	**1.** "I guess you can't really take a picture of it, but I guess my privileges are important to me...Privileges, like what I am allowed to do...I'd have a lot more, I guess, restrictions if we lived in town." **2.** "I think that there is a lot more to do out in the country because it's a lot more peaceful at night because you don't have to hear cars going 'broom' by your house...With living out in the country I think it's really nice at night and in the mornings, like the sunsets and sunrises I guess, and the moos...Just the sight of it." **3.** "I like it in the summer because there is a lot of trees and stuff and you go out and we, [Sam] and I go out in the trees and we tear down twigs and we make little tepees." **4.** " It's where I live...I learn some different things while I live there." **5.** "It kind of stinks a little bit...yah cows...It's not that I don't like it, it's just that I am really used to it so I couldn't care less."
1b		Horse	Family Farm/ Pets	Sense of achievement, accomplishment, responsibility, belonging	**1.** My responsibility **2.** Fun, skills, meet new people	**1.** "I guess she is my responsibility like I said last time." **2.** "Fun...I go to 4-H with her and stuff like that. In 4-H we learn how to do proper riding skills and stuff like that. And you meet new people there, and their horses."
1b		School	Social world, Built environ-ment,	Time spent, friends, education, sense of community	**1.** Spend my time, meet new people, friends, where I learn **2.** Community	**1.** "It's where I spend most of my year, I guess, most of my time. Meet new people there, make new friends there and that's where I learn...That's how I get knowledge and intelligence and stuff like that." **2.** "I think it's a pretty big part of the community, being a school and all."

Appendix F: **Breakdown and analyses of students' test scores for knowledge-based tests**

Table F1: Pre-program, post-program, and follow-up test analyses for Science 10 class

PRE-PROGRAM (August 31st, 2004)																													
Student ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**DR /13**	**Total /27**
Student 1	0	1	1	0	0	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	1	6	10
Student 2	1	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	1	1	0	1	1	0	0	1	0	5	9
Student 3	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0	1	1	0	0	0	1	0	0	1	0	0	1	5	9
Student 4	1	1	0	0	1	1	1	1	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	1	1	0	1	10	19
Student 5	1	1	1	1	0	1	1	1	1	1	0	0	0	1	0	1	1	0	0	1	0	1	1	1	0	0	1	9	17
Student 6	1	0	1	1	0	1	1	1	1	0	1	0	0	0	0	1	0	1	1	0	0	0	1	1	0	0	0	5	13
Student 7	0	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	1	1	0	0	1	0	0	1	0	1	0	6	9
Student 8	1	0	1	1	1	0	1	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	4	11
Student 9	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	0	1	0	12	23
Student 10	0	0	1	0	0	1	1	1	0	0	1	0	0	0	0	1	0	0	1	0	0	1	0	1	1	0	1	3	11
Total correct per item	6	5	6	4	3	8	7	7	5	7	9	2	2	3	1	6	5	4	3	3	4	5	7	7	3	2	7	MEAN	
Differential (%)	60	50	60	40	30	80	70	70	50	70	90	20	20	30	10	60	50	40	30	30	40	50	70	70	30	20	70	48.519	
Biserial Correlation *(r)*	0.5	1.0	.67	-.17	.67	0.0	1.0	0.5	1.0	.50	0.0	.67	.33	.33	.67	.17	0.5	1.0	-.5	-.5	.5	-.17	0.5	.17	.67	-.5	0.5	0.3704	
Mean																								**KR20** = 0.76098				6.5	13.1
Standard Deviation																												2.8771	4.9091751
POST-PROGRAM (November 5th, 2004)																													
Student ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**DR /13**	**Total /27**
Student 1	0	1	0	1	1	1	1	0	1	0	1	0	0	0	0	0	1	0	0	0	1	0	1	1	0	0	1	7	12
Student 2	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	0	0	0	0	4	10
Student 3																													
Student 4	0	1	0	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	13	22
Student 5	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	0	11	23
Student 6	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	1	0	1	0	1	1	0	0	0	8	14
Student 7	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	0	4	7
Student 8	0	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	0	0	1	1	0	1	0	0	0	1	10	15
Student 9	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	0	1	12	23
Student 10	0	1	0	0	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0	0	0	1	0	1	0	1	7	10

POST-PROGRAM (November 5th, 2004))…Continued from previous page																													
Student ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**DR /13**	**Total /27**
Total correct per item	4	7	4	6	6	8	8	7	7	5	5	2	1	2	3	5	7	4	4	4	8	4	8	5	4	3	5	MEAN	
Differential (%)	40	70	40	60	60	80	80	70	70	50	50	20	10	20	30	50	70	40	40	40	80	40	80	50	40	30	50	50.37	
Biserial Correlation *(r)*	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	1	1	0	0	1	1	0.5	0.5	0.5	0.5	0.5	0.5	1	0	1	0.5	0	0	0.537	
Mean																								**KR20** = 0.89106				8.44	15.111111
Standard Deviation																												3.283	6.1327898
FOLLOW-UP (March 7th, 2005)																													
Student ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**DR /13**	**Total /27**
Student 1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	1	1	0	1	0	1	1	0	1	1	11	18
Student 2	1	1	1	0	0	1	0	1	1	1	1	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	6	12
Student 3	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	1	1	0	1	0	1	1	0	1	1	11	18
Student 4	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	0	1	1	1	12	21
Student 5	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	13	24
Student 6	1	1	0	0	0	1	0	1	1	1	1	0	0	0	1	1	1	1	1	0	1	0	0	0	1	0	0	9	14
Student 7	1	1	0	1	1	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1	0	0	0	5	10
Student 8	0	0	1	1	1	1	0	1	1	1	1	0	0	0	0	1	1	0	1	0	1	0	1	0	1	1	1	9	16
Student 9	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	13	25
Student 10	0	1	0	0	0	0	0	1	1	1	1	0	1	0	0	1	1	0	0	0	1	0	1	0	0	1	1	9	12
Total correct per item	5	9	7	6	7	9	5	10	9	9	9	2	1	3	6	7	7	6	8	4	8	3	7	4	5	7	7	MEAN	
Differential (%)	50	90	70	60	70	90	50	100	90	90	90	20	10	30	60	70	70	60	80	40	80	30	70	40	50	70	70	62.963	
Biserial Correlation *(r)*	-.33	0.0	0.5	.17	0.5	0.5	1.0	0.0	.5	1.0	0.5	-.17	0.0	.67	.67	0.5	0.5	1.0	0.5	1.0	0.5	1.0	1.0	-.17	1.0	0.5	1.0	0.5125	
Mean																								**KR20** = 0.88536				9.8	17
Standard Deviation																												2.7406	3.8944405

Table F2: Pre-program, post-program, and follow-up test analyses for control group, Science 9 class

PRE-PROGRAM (September 1st, 2004)																													
Student ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**DR /13**	**Total /27**
Student C1	0	1	0	0	1	1	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	1	6	9
Student C2	0	0	1	0	1	1	0	1	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	4	8
Student C3	0	0	1	0	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	6	10
Student C4	1	1	0	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	0	1	1	0	0	1	0	1	1	12	19
Student C5	0	1	0	0	1	1	0	1	1	0	0	1	0	0	1	1	0	0	0	0	1	0	1	0	0	0	0	7	10
Student C6	1	0	1	0	1	1	0	0	1	1	1	1	0	1	1	1	1	0	0	0	1	1	0	0	1	0	0	6	15
Student C7	0	0	1	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	4	9
Student C8	0	0	1	1	1	1	0	0	0	0	1	1	1	0	0	1	1	0	0	0	1	1	0	1	0	1	0	4	13
Student C9	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	2	6
Student C10	1	0	1	0	1	1	1	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	5	10
Total correct per item	3	3	7	2	10	10	4	5	5	4	5	3	1	1	5	6	6	1	2	2	5	3	2	3	3	3	5	MEAN	
Differential (%)	30	30	70	20	100	100	40	50	50	40	50	30	10	10	50	60	60	10	20	20	50	30	20	30	30	30	50	40.3703	
Biserial Corr. *(r)*	.67	.33	-.33	.33	0.0	0.0	.33	.17	1.0	.67	.50	.67	.33	.33	.67	1.0	1.0	.33	-.5	-.5	1.0	.67	0.0	.67	-.17	.67	-.17	0.3580	
Mean																									**KR20**=0.738			5.66666	11
Standard Deviation																												2.82842	4
POST-PROGRAM (December 8th, 2004)																													
Student ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**DR /13**	**Total /27**
Student C1	0	1	1	0	1	0	1	0	1	1	1	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	5	11
Student C2	0	0	1	1	0	0	0	0	1	1	1	0	0	1	1	0	1	0	0	0	0	0	1	0	1	0	1	6	11
Student C3	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1	1	1	0	0	0	1	4	8
Student C4	1	1	1	0	1	1	1	1	1	1	1	0	0	0	1	1	1	1	0	0	1	1	1	0	0	1	1	12	19
Student C5	1	1	1	1	1	1	0	1	1	1	0	1	0	0	1	1	1	0	0	0	1	0	1	0	1	1	1	11	18
Student C6	0	1	1	0	1	1	0	0	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	0	1	1	1	11	19
Student C7	0	0	1	0	1	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	1	1	0	0	0	2	8
Student C8	1	1	1	0	1	1	0	0	1	0	1	1	0	0	0	1	1	0	0	0	1	0	1	1	1	0	1	7	15
Student C9	0	1	1	1	0	0	0	0	1	0	1	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0	5	9
Student C10	0	1	0	0	1	1	0	1	1	0	0	1	0	0	1	0	1	1	0	0	0	1	1	0	0	0	0	8	11
Total correct per item	3	7	9	3	7	5	3	3	8	5	7	6	0	3	5	6	9	4	1	0	6	4	9	2	4	4	6	MEAN	
Differential (%)	30	70	90	30	70	50	30	30	80	50	70	60	0	30	50	60	90	40	10	0	60	40	90	20	40	40	60	47.777	
Biserial Corr. *(r)*	.67	.50	.50	.33	0.0	.50	-.17	.17	.50	1.0	.17	.67	0.0	.33	.50	1.0	0.0	.17	-.5	0.0	1.0	.67	0.0	-.5	.67	1.0	1.0	0.3765	

Mean																							**KR20**=0.77987				7.1	12.9
Standard Deviation																											3.5355	4.6755867
FOLLOW-UP (February 28th, 2005)																												
Student ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**DR /13**	**Total /27**
Student C1	0	1	1	1	1	0	1	0	0	1	0	0	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	4	10
Student C2	0	1	0	1	1	1	0	0	1	0	1	0	0	0	1	1	1	0	1	1	1	1	1	0	0	0	1	9	15
Student C3	0	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	0	0	1	7	11
Student C4	1	1	1	0	1	1	1	1	1	1	0	0	0	0	1	1	1	1	0	0	1	0	1	0	0	1	1	12	17
Student C5	1	1	1	1	1	1	0	1	1	1	0	1	0	0	1	1	1	1	0	0	1	1	1	0	1	0	1	11	19
Student C6	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	0	0	1	1	12	21
Student C7	0	0	1	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	0	4	10
Student C8	1	0	1	1	1	1	0	1	1	1	0	1	0	0	0	0	1	0	0	0	1	1	0	1	1	1	1	8	16
Student C9	1	1	1	0	0	1	0	1	1	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	1	8	11
Student C10	0	1	1	1	1	1	1	1	1	0	0	1	0	0	1	0	1	1	0	0	0	1	1	0	0	1	0	9	15
Total correct per item	5	8	9	7	9	9	3	7	8	6	2	4	1	1	5	5	8	5	3	1	7	6	9	3	3	4	7	MEAN	
Differential (%)	50	80	90	70	90	90	30	70	80	60	20	40	10	10	50	50	80	50	30	10	70	60	90	30	30	40	70	53.7037	
Biserial Corr. *(r)*	1.0	0.5	0.0	.17	0.0	0.5	-.17	1.0	0.5	0.0	.33	.67	-.5	.33	1.0	1.0	0.5	1.0	-1	0.0	1.0	.17	0.0	-.5	-.17	.67	1.0	0.3331	
Mean																								**KR20**=0.702198				8.4	14.5
Standard Deviation																												3.0413	3.8944405

Appendix G: Summary of qualitative data - the building of sense of place